RAILROAD GAZETTE

FRIDAY, MARCH 26, 1897.

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Contributions.

Rapid Transit in New York.

NEW YORK, March 22, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Throughout the discussion of the paper by Mr. Derr (read and discussed on March 18 before the New York Railroad Club) it seems to be tacitly assumed that fares are to be five cents, irrespective of distance traveled although it is now well understood that a uniform fare of five cents can only be profitable for lines which have also a large traffic with short trip passengers. These latter pay proportionately a very high price for transportation. A person riding one mile pays at the rate of five cents a passenger mile, whereas a person carried 10 miles or 15 miles pays only at the rate of one-half or one-third of a cent. per passenger mile, which is a great deal less than cost. The short haul passenger is taxed for the benefit of the long haul passenger, who gets his transportation below cost. It appears that in the Manhattan elevated railroad system we have reached the limit of the (distinctly American) one fare system in which the long haul and short haul passenger traffic together yet suffice for an adequate return on the invested capital.* The Brooklyn elevated railroads were in the same fortunate condition for a few years until the electrical railroads took away from them a large proportion of the short haul traffic, and from that time they ceased to be profitable. The same experience is had in Chicago.

Steam railroads, whose average cost (including the city and suburban mileage) is $100,000 per mile, cannot afford to, and rarely do carry commuter passengers for less than ½ cent. per passenger mile. How can a rapid transit railroad, whether elevated or underground, whose cost of construction is 4 to 20 times greater (per mile), afford to carry passengers at the rate of ⅛ cent per passenger mile, after allowing for all the possible economies of operation? In this question, it seems to me, we have in a nutshell the problem of rapid transit.

There is not the slightest question that we can build an elevated railroad very economically, and an underground railroad very economically, that we can build stations close together, roomy and with every convenience that modern needs require, and that we can provide, too, every passenger with a seat, provided he will pay the price fer all these conveniences.

I do not believe that any kind of rapid transit road from the upper part of the city to the business section in the lower part (8 to 15 miles) can be built to carry express passengers for five cents, as the present elevated railroads do, and furnish seats and better conveniences, and come out at the end of the year without a big deficit. A new rapid transit road in New York could not attract sufficient short haul business in competition with the cable lines and electrical railroads, which a passenger can take at every street corner, and which for a short trip he is more likely to take than an underground or overhead railroad.

The development and improvements of the street surface railroads will teach us yet some costly and valuable lessons. The new electrical lines will cut into the short haul passenger traffic of the elevated railroads still more than the cable lines on Broadway, Lexington and Third avenues have already done. The elevated railroads will lose more and more the short haul business and will be able to keep the long haul passengers only when they can set them down near their destination, in a much shorter time than the competing street surface lines may do it. So that in the end the elevated railroads may be reduced to the almost exclusive traffic of long haul passengers in the express trains, which is the least profitable, if not a distinctly losing business.

A new rapid transit system with five-cent fares would have to compete with both: with the surface lines (which are being constantly improved) for short trip passengers, and with the elevated railroads for long trip passengers. It may be done with the aid of municipal taxation, to cover the yearly deficit in the operation and fixed charges, but not otherwise. Whether with fares higher than five cents sufficient business could be obtained for a new rapid transit road would be an experiment which again could only be safely tried with municipal credit. If the solution of the rapid transit problem had been left to private enterprise, it would have solved it the quickest; it would probably have solved it by this time. But the legislation in that respect and for that purpose was not favorable. Moreover, financiers know now from experience the instability of legislative grants, the strikes and attacks upon invested capital, and they would rather have the municipality take these risks.

The addition of four more tracks for express trains to the present elevated railroad system would provide additional transportation capacity north and south for 120 million passengers per year. It would be the cheapest and quickest solution on the item of cost of construction. But the prospect of damage suits of 30 to 50 million dollars, and of additional taxes right from the start, acts as a very effective deterrent.

It would be a safer investment for the city to buy the elevated railroads and to expand them, than to build a new system. The municipality having the power of assessment and taxation could equitably distribute the expense for purchase and expansion, and for gradual rebuilding and improvement. The landowners benefited would pay their proper proportion in the form of increased taxes. Benefits and damages to property could be ascertained and treated in the same manner as in the case of street openings, or other municipal improvements. Private capital, in such undertakings, must pay damages, but cannot claim a share of the increased value of property. The inducements to private capital must therefore be sufficient to offset this disadvantage, a condition which rapid transit legislation, as mentioned before, does not take sufficiently into account.

But there are other conditions arising which make the financial prospects of any new rapid transit railroad in New York City, undertaken by private capital, very doubtful. I refer to the proposed bridges and tunnels for crossing the East and North rivers, providing lateral outlets from the business portion of New York to territories and districts where land can be obtained for homes very cheap, indeed for less than one-tenth the price ruling above the Harlem. Rapid transit lines crossing the rivers can count on getting a large business at higher fares than five cents, because the suburban passenger can make it up in the lower rent, in the lower price for a home, and in lower taxation.

There is one plan which would give great relief to suburban and city passengers from the north, but which could not be carried out under the present rapid transit legislation. It would be the extension of the railroad tracks on a viaduct from the Forty-second street Grand Central Station to the City Hall, and from the old Hudson River line, at Seventieth street, with a 2 or 4-track viaduct to Chambers street, thence by a loop line on Chambers street to the aforesaid viaduct from Grand Central Station. As a loop line for passenger trains from the north it would afford the greatest facilities and command a large local and suburban traffic, besides the freight traffic, which would be perhaps the most valuable. The city might build it and then lease it, or build it under an arrangement with the railroad on conditions previously agreed upon, similarly to the present Park Avenue viaduct, built by a combination of the city and the New York Central Railroad. G. LINDENTHAL.

*The average distance per passenger for this system has repeatedly been stated to be from 2.2 to 2.4 miles, from which it is concluded that the rate per average passenger mile should not be under 2 cents to return current interest on the invested capital, under conditions similar to those for the Manhattan elevated railroads. [Last September Mr. Theodore Cooper concluded that the average distance was 3.4 miles. Probably this is increasing.—EDITOR.]

Hearing on New York Grain Rates.

The Interstate Commerce Commission sat in New York City four days last week and heard the argument and evidence presented by the New York Produce Exchange in its complaint of injustice in rates on grain from the West, and then adjourned until May 10, when a hearing will be held in Philadelphia. The grain merchants in Philadelphia and Baltimore desired time to investigate the evidence presented by the New York men.

At the opening of the hearing the commercial organizations of Baltimore and Philadelphia presented remonstrances against any reduction of the differentials. The New York argument was made by Mr. John D. Kernan. Tables were given showing the present rates as stated in the tariffs, but "the petitioner relied upon witnesses to ascertain the actual charges for storage, lighterage, elevator service," etc. We summarize Mr. Kernan's argument below, those passages which are in solid type being verbatim quotations.

The arbitrary differentials of two cents and three cents in favor of Philadelphia and Baltimore respectively as against New York were, on July 20, 1882, approved by an Advisory Commission, composed of Allen G. Thurman, Elihu B. Washburne and Thomas M. Cooley. This Commission was employed by the trunk lines in January, 1882, to consider the differentials and to advise how to stop rate wars The Commission decided for the differentials and against every claim for their modification made by the New York commercial and railroad interests, and with great skill and force marshaled every fact and argument to sustain their conclusion. That report has ever since been the Gibraltar of these differentials through all vicissitudes of trade conditions.

The fact that these differentials were justifiable in 1882 does not warrant their retention now. In fact the Commission above named explicitly stated that the rates would need to be modified when conditions changed. It recognized that

"If the mileage standard were adopted, the freight charges between New York and Chicago would be about 10 per cent. greater than those between Philadelphia and Chicago and about 13 per cent. more than those between Baltimore and Chicago. According to the average rates on grain and provisions this year (1882), the differentials have only been about 6⅜ per cent. in favor of Philadelphia, and 10 per cent. in favor of Baltimore; and the distance principle would, therefore on an average, increase them greatly. The general fact is that distance does not determine railroad charges, and that where competition is most active it influences them the least. The distance principle does not, therefore, stand the test of competition, and so far as we can perceive there is no possibility of establishing it except by subordinating competition altogether to it."

Under the average rates on grain and provisions for 1896, the differentials have been 10 per cent. in favor of Philadelphia, and 15 per cent. in favor of Baltimore. At the present export corn rate of 15 cents to New York, the percentage of the differentials in favor of Philadelphia is 13⅛ per cent. and in favor of Baltimore 20 per cent. Mr. Kernan went on to show that now, the rates having fallen, the percentage is sometimes as high as 25 per cent. in favor of Baltimore, Newport News and Norfolk. Mr. Fink showed some years ago that grain would go by the route which was cheapest through from the West to Europe. The argument goes on to show that, at present, rates to Europe are constantly lower through Baltimore than through New York. On a mileage basis the rates from Chicago to the different seaboard ports would be (cents per 100 lbs.):

	Mileage.			
To New York	912	15	20	25
" Boston	1,000	16½	22	27
" Baltimore	802	13¾	17½	22
" Philadelphia	822	13¾	18	24½
" Newport News	896	14¾	19½	24½
" Norfolk	984	16	21½	27

Thus the Southern ports are now getting more advantage than the distance principle would allow them.

"Complainant cannot deal with the cost question because the railroads keep the facts to themselves," but it is believed that no substantial differential would be justified by the cost of service. Some figures are given of the average cost per ton per mile on the Pennsylvania road, but they prove nothing except that rates are not based on cost.

New York no longer has any practical advantage in ocean rates. Aside from railroad impositions it necessarily costs more to export and import through New York to-day than any other port, and hence the differentials ought to be rather in her favor than against her.

The rates are not now alike "from Chicago through the different ports to foreign ports like Liverpool," because there is no longer practically any material difference in ocean rates from the different ports, and the differentials lower the inland rates at the other ports. The rates are lower through the other ports by just about the amount of the differentials in their favor.

This statement is made on the assumption that terminal charges are maintained. If ships will go to one port as cheap as another New York ought to have more advantage. If terminal charges are not maintained the difference in favor of the other ports is even greater than shown. Boston gives 20 days' free storage, which is worth five mills per 100 lbs. It is believed that still longer free storage is given secretly. There are said to be arrangements favoring other ports between railroads and steamers. "We would like to know what they are, and would like to have it explained why the Chesapeake & Ohio in 1896 paid $213,650 to an ocean line. If necessarily and properly paid to recoup ocean losses it would look as though the road should have its present inland rate raised unless it is anxious to follow the Baltimore & Ohio and the Norfolk & Western into bankruptcy."

For a year and a half differentials have been maintained (before that they were secretly varied or abolished), and New York's percentage of the grain business has steadily fallen off. Comparisons with 1882 are made as follows:

WHEAT, CORN AND FLOUR EXPORTS.

	N. Y.	Bost.	Phila.	Balt.	N. News.	Norfolk.
	p. c.	p. c.	p. c.	p. c.	*p. c.	p. c.
1882	61.5	9.6	7.5	20.7	.06	.01
1896	33.7	12.7	9.5	26.6	10.	7.5

* From July 1 to Dec. 31, 1882.

We find that New York had 76 full cargoes in 1895, as against 58 at all other ports, while in 1896 she had but 79 against 327. Now, New York has no full cargo business. Cargo business has left New York, because under the enforced differentials grain can be put aboard at other ports cheaper, especially lake grain [which goes from Erie to Philadelphia at one cent a bushel less than from Buffalo to New York], and also because of the differential within a differential involved in the one cent railroad elevator charge at New York, insisted upon by those who control the New York roads through the Joint Traffic Association.

The only reason that New York holds any grain trade against the differential odds is because she still has a large amount of berth trade with ports abroad with which the out ports have not as yet direct communication. Something is also preserved by the fact that it is difficult to divert trade from fixed channels. New York in 1895 exported 39 966,080 bushels of wheat and corn out of a total exportation of 78,327,668 bushels. In 1896, New York, 37,576,453 bushels; total exported, 123,259,154 bushels.

Nothing other than the differentials can have affected New York thus seriously, because there is nothing that did not affect it in 1895 as well as in 1896.

Mr Kernan next took up the differentials from Buffalo

and Erie on lake grain, the rates being 1¼ cents per 100 lbs. cheaper, on the average, to Philadelphia and Baltimore than to New York. The distances are—

SHORTEST DISTANCE ROUTE.

	Miles.
Buffalo to New York	410
Buffalo to Boston	481
Buffalo to Philadelphia	418
Buffalo to Baltimore	402
Erie to New York	512
Erie to Boston	569
Erie to Philadelphia	506
Erie to Baltimore	490

"If there is any principle at all in these differentials the rate to New York ought to be at least 1.50 cents less than to Boston. New York is cut both ways, as usual."

In the winter, vessels subject to the rules of the British Board of Trade can carry from 300 to 700 tons more from Baltimore than from more northerly ports. This favors the southern ports. The differentials were sustained in 1882 largely because vessel rates were higher from the outports. Now this difference is substantially removed.

The question at issue must not be confused, said the speaker, by assuming that if all terminal charges were removed at New York there would be any remedy of the difficulty. The same differentials being insisted upon, there would simply be a lowering of rates at New York and Baltimore by the same amount at each place, and the real difficulty would remain unremedied.

The railroads at New York drive ocean ships away from their elevators by charging one cent a bushel more than they do on grain delivered to coastwise vessels The lighterage charge, three cents per 100 lbs., is too high. The actual cost is not over ½ to ¾ of a cent.; but even with the lighterage left out of the question the differentials would still need to be changed.

In conclusion, the complainant asked that the facts be fully investigated, that the differentials be abolished in whole or in part, that differentials from lake ports be entirely abolished, and that lighterage be charged at no more than a fair rate.

The first witness before the commission was Mr. O. M. Mitchell, a New York grain exporter, who gave statistics showing how he had formerly shipped from 80 to 90 per cent. of his wheat through New York, but now ships only 25 or 30 per cent.; and how formerly he sent 50 and 75 per cent. of his corn through New York, but now only 20 to 29 per cent.

The general tendency of ocean rates, taking a number of years as a basis, has been toward lower rates. One reason is that steamers are now built to carry more cargo. Generally speaking, berth rates are low or high uniformly at all Atlantic ports. The bulk of the grain business at New York and Boston is usually done on the berth. Full cargo rates as a rule are usually higher than berth rates. There was more uniformity in rates for full cargoes. The range of rates for full cargoes had, as far as witness could remember, in American money ranged from 6¾ cents per bushel to 13½ cents per bushel. Cargo rates were substantially the same at all points. There was cross-examination by counsel for the railroads intended to show that other causes operated to send corn through other ports, but nothing definite was brought out.

Mr. John P. Truesdell, another exporter, gave testimony tending to show the same conditions. For the last year grain has cost from ⅛ cent to 4 cents a bushel more at New York than at other ports. One-eighth cent a bushel (say $1.25 per car) was sufficient to divert shipments from one port to another. Ocean rates from Boston have been from ¼ to ⅛ cent less per bushel than from New York. Most of the grain is bought and sold at New York, whichever route it goes by. Witness preferred to ship through New York because he then had the grain under his own supervision and banking facilities were more liberal.

It appears that one reason why New York has lost corn more than wheat is that wheat goes largely to Portugal and South Africa, which countries have not yet become acquainted with the other ports.

Mr. Henry B. Hebert gave testimony concerning lighterage charges and concerning the grading of grain at New York. Corn not quite fit to grade as No. 2 is improved by screening and blowing, and this manipulation of grain is not done at other ports. Another reason why New York still holds some wheat trade is that that grain is speculated in more at New York.

Mr. Arthur Mills, General Traffic Manager of the Boston & Albany, testified concerning the export traffic through Boston. Occasionally grain is stored at Boston free more than 20 days, but not often. Free storage is given because the grain goes on through bills of lading, and there is no one to collect from. The ocean vessels, except those of the Cunard Line, have free wharfage at the Boston & Albany wharf, but the road has no contract with any ocean carrier, either as to rates or shipments. The Canadian Pacific is taking grain to St. John, N. B., at the Boston rate and is trying to make that an export port. The Grand Trunk does the same at Portland.

Mr. Spence, a New York steamship agent, testified that at New York business in full cargoes had declined. Of 120 steamers which he brought to New York in 1896 only 28 were loaded there; the remainder went to Baltimore, Newport News and other ports for loads. Ocean rates from New York in 1896 fluctuated as much as six cents a bushel, but the fluctuations had been just as marked at other ports. Ordinarily the fluctuations are not over three cents a bushel in a year. Mr. Spence has done business at the Gulf ports; rates from there are about 1½ cents a bushel higher than from New York. A vessel will go from New York to another port for an addition of ⅜ of a cent per bushel. Witness denied that his firm had arrangements with either the Norfolk & Western or the Chesapeake & Ohio.

Mr. F. B. Thurber made a general argument, showing the necessity of readjusting the differentials.

Mr. F. E. Hadley, an exporter of flour, stated that since the enforcement of the differentials he had found himself unable to ship flour to Europe through New York.

Commissioner George R. Blanchard, of the Joint Traffic Association, testified as to the action of the association in maintaing rates and eliminating irregularities. His office had had to deal with about 86,000 tariffs in the year 1896. Mr. Blanchard dissented from the argument of Mr. Kernan that the Erie Canal had ceased to be a factor in the grain trade; it brought about 17 per cent. of the grain which came to New York for export in 1896. Mr. Blanchard explained how an individual road might, by the action of its Board of Directors, change a rate in spite of the recommendation of the Board of Managers. The speaker said that he welcomed the present investigation and he asserted that the association was the right arm of the Interstate Commerce Commission.

Samuel Taylor, Jr., Secretary of the Brooklyn Wharf & Warehouse Company, testified concerning elevator charges at New York. His company has capacity for about 15 million bushels of grain and charges 1¼ cents a bushel. Replying to a question, he denied that this was in violation of the state law limiting elevator charges to ⅝ of a cent.

M. De Puy presented a statement on behalf of the Canal Boat Owners' Association. He claimed that the present diversion of trade from New York was largely due to terminal charges at Buffalo and New York. In 1888 a law of New York fixed the maximum charges for elevating and transferring grain at ⅝ of a cent per bushel. "But," continued Mr. De Puy,

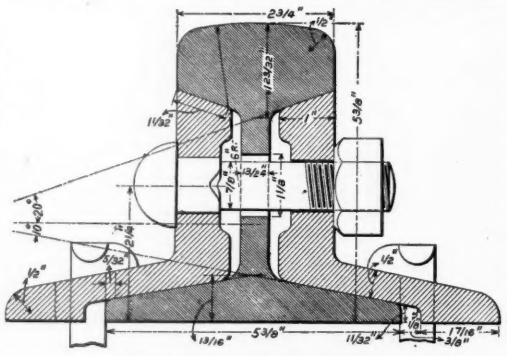
"At Buffalo the elevator owners were not satisfied with this liberal allowance and immediately decided to receive no grain for direct transfer. They then enforced a charge of ¼ cent for storage for every 10 days or part thereof, under which provision they collect the extra charge, even though the grain goes directly through the elevator into the canal-boat. Another illegal charge exacted at Buffalo is one of $1 65 per thousand for the use of the steam shovel. The total illegal charge at Buffalo for elevating 100,000 bu. of grain is $415, which added to the $625 which the law allows, makes a total of $1,040. Adding the charges for 'scooping' and trimming canal-boat, the total cost of transferring 100,000 bu. of grain from lake to canal is $1,300.

"At New York the Brooklyn Wharf and Warehouse Company charge ⅝ of a cent a bushel for elevating and receiving, but in addition they charge ⅛ a cent for delivery from store to ship and $\frac{5}{16}$ of a cent. for weighing out of store, making a total illegal charge of $812.50 for the transfer of 100,000 bu. of grain at this port. The total cost of placing 100,000 bu. of grain from canal boat to steamer at New York is $1.250 by floating elevator The representative of the Brooklyn Wharf and Warehouse Company has testified here that they charge 1¼ cents, while the law allows only ⅝ of a cent."

In answer to a question, Mr. De Puy said that the elevators at Buffalo were controlled by the railroads. "In 1894 five individuals undertook to elevate grain at Buffalo for ⅝ of a cent per bushel. The railroads then not only elevated grain free, but paid a bonus for the privilege of elevating it. As a result they forced the independent men into a pool, and the day they did it the elevator charge went up ⅞ of a cent per bushel."

The New Rail for the Imperial Chinese Railways.

The engravings show a section of the rail and joint for the Imperial Chinese Railways of North China, for the new line from Tientsin to Peking, and also the spike and track bolt. This rail was designed by Mr. C. P. Sandberg, of London, and rolled at Barrow, England, 1896, and cost, delivered at Taku, $23 a ton, gold. It weighs 85 lbs. per yard and having a pretty broad base, Mr.



85-Lb. Rail—Chinese Railways.

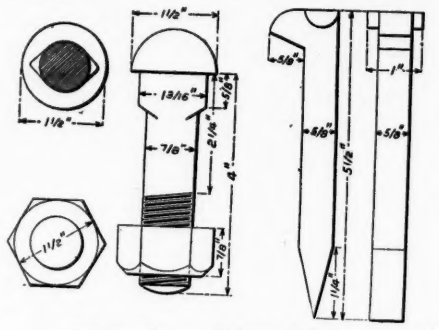
Kinder (Chief Engineer) does not consider tie plates necessary except on sharp curves in yards, etc. The average chemical analysis of the metal is as below:

Carbon	0.410
Silicon	0.068
Phosphorus	0.056
Manganese	0.880
Sulphur	0.023

The drop tests, 3 ft. between supports, 20-ft. fall, with a hammer of 2,240 lbs., give an average defection of 2.5 in. The dimensions of the rail and fastenings are sufficiently shown on the engravings, except that a suspended joint is used, the angle plates being 21 in. long with four bolts. It will be seen that the design embodies the fundamental ideas of the recommended section of the American Society of Civil Engineers, except that the crown radius is short, being 6 in., and the upper corner radius is longer, being ½ in., instead of 12 in. and $\frac{5}{16}$ in. respectively. The relative distribution of metal in the head, web and flangs is as follows, in percentages:

	China.	Am. Soc. C. E.
Head	45	42
Web	18	21
Flange	37	37

The area of the Chinese rail has been taken by a planimeter from a blue print, and may be somewhat inaccurate.



Rail Fastenings—Chinese Railways.

Decision of the Supreme Court in the Case of the Trans-Missouri Freight Association.

The Supreme Court of the United States has decided the case of the Trans-Missouri Freight Association against the railroads. The opinion reverses the decision of the courts below, and holds the anti-trust law of 1890 to be applicable to railroad transportation and the agreement of the association illegal. Justice Peckham delivered the opinion, which was concurred in by Chief Justice Fuller, Justice Harlan, Justice Brewer and Justice Brown. Justice White announced a dissenting opinion, concurred in by Justices Field, Shiras and Gray.

Judge Peckham reviewed the history of the case. The bill was filed by the government under the Sherman anti-trust act of 1890. The defendants had denied the government's allegations in respect especially to the point of improper intent, and upon these showings the case proceeded to a hearing. The court below decided that the Sherman act did not apply to railroads, and therefore refused to sustain the government. It was also held by the lower court that even if the act did apply the agreement was not one looking to the "unreasonable restraint of trade."

Justice Peckham, in his decision, overrules nearly every point made by the defendant. The defendants held that the suit should be dismissed, first, on the ground that the Trans-Missouri Freight Association had been dissolved by a vote of its members since the judgment entered in the suit by the court below; and, second, that the requisite amount—more than $1,000—is not involved in the controversy. As to the question of dissolution, the Court says:

"It is shown that these very defendants, or most of them, immediately entered into a substantially similar agreement, which was to remain in force for a certain time, and under which the companies acted, and in regard to which it does not appear that they are not still acting."

Coming to the merits of the suit, Justice Peckham states that there are two important questions (1) whether the Trust act applies to common carriers by railroad, and (2), if so, does the agreement set forth in the bill violate any provision of that act? As to the first question, the Court held:

"A contract that is in restraint of trade or commerce is by the strict language of the act prohibited, even though such contract is entered into between competing common carriers by railroad, and only for the purposes of thereby affecting rates for the transportation of persons and property. If such an agreement restrains trade or commerce it is prohibited by the statute. We see no escape from the conclusion that if any agreement of such a nature does restrain it the agreement is condemned by this act. The point urged on the defendant's part was that the act was not really intended to reach that kind of an agreement relating only to traffic rates entered into by competing common carriers by railroad. The terms of the act do not bear out such construction.

"The Interstate Commerce act does not authorize an agreement like the one in question. It may not in terms prohibit, but it is far from conferring, either directly or by implication, any authority to make it. If the agreement be legal, it does not owe its validity to any provision of the commerce act, and if illegal it is not made so by that act.

"We see nothing either in contemporaneous history, in the legal situation at the time of the passage of the statute, in its legislative history or in any general difference in the nature or kind of trading or manufacturing companies from railroad companies which would lead us to the conclusion that it cannot be supposed the legislature, in prohibiting the making of contracts in restraint of trade, intended to include railroads within the purview of that act.

"The next question is, does the agreement restrain trade or commerce in any way so as to be a violation of the act? We have no doubt that it does. The agreement on its face recites that it is entered into 'for the purpose of mutual protection by establishing and main-

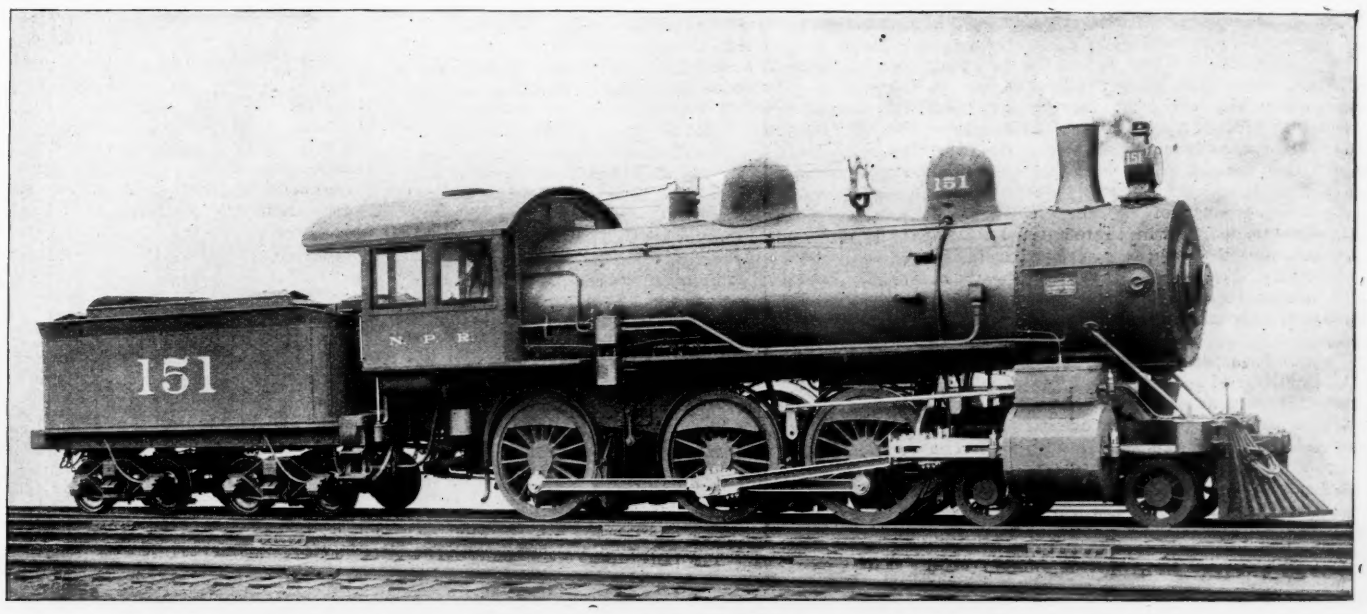
taining reasonable rates, rules and regulations on all freight traffic, both through and local.' To that end the association is formed, and a body is created which is to adopt rates, which, when agreed to, are to be the governing rates of all the companies, and a violation of which subjects the defaulting company to the payment of a penalty, and, although the parties have a right to withdraw from the agreement on giving 30 days' notice of a desire so to do, yet, while in force and assuming it to be lived up to, there can be no doubt that its direct, immediate, necessary effect is to put a restraint upon trade or commerce, as described in the act."

The dissenting opinion by Justice White holds that the decision of the court followed the letter of the law, which killeth, rather than the spirit which giveth life. The ultimate result of that decision, if the reasoning were followed out, would be equivalent to a decree that there must be no trade.

Heavy Compound Freight Locomotive for the Northern Pacific.

The engraving is from a photograph of a 10-wheel freight locomotive, one of two just completed by the Schenectady Locomotive Works for the Northern Pacific. The general design and details of the locomotives were worked up by Mr. E. M. Herr, Superintendent of Motive Power of the Northern Pacific, in consultation with the Schenectady Locomotive Works.

The locomotives are the largest of this type ever built and have extraordinarily large boilers, the heating surface being nearly 2,900 sq. ft. All the details of the engines were designed with a view of giving the maximum of heating surface of boiler with a given weight; to accomplish which cast, forged and pressed steel were used extensively in place of cast and wrought iron.



Ten-Wheel Compound Freight Locomotive—Northern Pacific Railroad.

Designed by E. M. HERR, *Superintendent of Motive Power.* *Built by the* SCHENECTADY LOCOMOTIVE WORKS, *Schenectady, N. Y.*

The driving wheels, driving boxes, cross-heads, frame filling castings, bumper knees, rocker shafts, etc., were made of cast steel, of as light section as consistent with safety; while pressed steel was used for dome ring, dome connection to boiler, smokebox front and door, steam chest and cylinder head covers.

The locomotives are of the two-cylinder compound type, having the Schenectady Locomotive Works design of intercepting valve, which enables the engine to be worked either simple or compound at will. While working compound on the grade out of Schenectady, pushing freight trains, one of the engines developed about 1,200 H. P., and its operation in the test, both as compound and simple, was most satisfactory.

SPECIFICATION OF SCHENECTADY TEN-WHEEL COMPOUND FOR THE NORTHERN PACIFIC.

General Dimensions.

Gage	4 ft. 8½ in.
Fuel	Bituminous coal
Weight in working order	172,500 lbs.
" on drivers	126,000 lbs.
Wheel base, driving	14 ft. 10 in.
" " rigid	14 ft. 10 in.
" " total	25 ft. 11 in.

Cylinders.

Diam. of cylinders	H. P., 22 in.; L. P., 34 in.
Stroke of piston	26 in.
Horizontal thickness of piston	4¾ in. and 5¾ in.
Diam. of piston rod	3½ in.
Kind of piston packing	Cast-iron rings, sprung in
" rod packing	Jerome metallic
Size of steam ports	H. P. 20 in. × 2⅝ in.; L. P. 23 in. × 2⅝ in.
" exhaust "	H. P. 20 in. × 3 in.; L. P., 23 in. × 3 in.
" bridges "	1⅝ in.

Valves.

Kind of slide valves	Allen-American
Greatest travel of slide valves	6½ in.
Outside lap travel of slide valves	H. P. 1¼ in., L. P. 1⅞ in.
Inside clearance " "	H. P. ¼ in., L. P. ¼ in.
Kind of valve stem packing	Jerome metallic

Wheels, Etc.

Diam. of driving wheels outside of tire	63 in.
Mat'l " " " centers	American cast steel
Tire held by	shrinkage
Driving box material	cast steel
Diam. and length of driving journals	
" " " main pin journals	9 in. on main only F. & B. 8½ in. dia. × 11 in.
" " " main crank pin journals	6½ in. dia. × 6 in.
" " " side rod crank pin journals—	
	main 7 in. dia. × 5¼ in., F. & B. 5½ in. dia. × 4¼ in.
Engine truck, kind	4-wheel swing bolster
" " journal	6 in. dia. × 11 in.
Diam. of engine truck wheels	30 in.
Kind of engine truck wheels	Standard steel tired, spoke center

Boiler.

Style	extended wagon top
Outside diam. of first ring	70 in.
Working pressure	200 lbs.
Mat'l of barrel and outside of fire box	carbon steel
Thickness of plates in barrel and outside of fire box	11/16 in., ¾ in., 5/8 in., 5/16 in. and ½ in.
Horizontal seams	Butt joint, sextuple riveted, with
	welt strip inside and outside
Circumferential seams	double riveted
Firebox, length	120⅜ in.
" " width	41 in.
Firebox, depth	Front 81 in., back 71½ in.
" material	Carbon steel
" plates, thickness	sides, 5/16 in.; back, 5/16 in.; crown, ⅜ in.; tube sheet, ½ in.
" water space	front, 4½ in.; sides, 3½ in. to 4 in. above grates; back, 3½ in. to 4½ in. at crown
" crown staying	Radial stays 1¼ in. diam.
" stay bolts	Ulster special iron, 1 in. diam.
Tubes, material	Charcoal iron, No. 12 W. G.
" number of	378
" diam.	2 in.
" length over tube sheets	13 ft. 6 in.
Firebrick, supported on	4 water tubes, R. R. Co.'s style
Heating surface, tubes	2 655.4 sq. ft.
" " water tubes	32.1 sq. ft.
" " firebox	208.0 sq. ft.
" " total	2,895.5 sq. ft.
Grate "	34.22 sq. ft.
" style	Rocking, R. R. Co.'s style
Ashpan, "	Sectional
Exhaust pipes	Single, high
" nozzles	5¼ in., 5½ in. and 5¾ diam.
Smoke stack, inside diameter	13 in. at top., 16 in. near bottom
" " top above rail	14 ft. 10½ in.
Boiler supplied by	Two Sellers, improved Class M., No. 10¼ injectors

Tender.

Weight, empty	37,800 lbs.
Wheels, number of	8, Cast-iron plate wheels
" diameter	33 in.
Journals, " and length	4½ in. dia. × 8 "
Wheel base	15 ft. 3 "
Tender frame	10-in. steel channels
" trucks	4-wheel, channel iron, center bearing, F. & B additional side bearings on back truck
Water capacity	4,350 U. S. gals.
Coal "	9 (2,000 lb.) tons
Total wheel base of engine and tender	52 ft. 9½ in.
" length " " " "	61 " 4½ "

Engine provided with American brake on all drivers, operated by air; Le Chatelier water brake on cylinders.
Westinghouse automatic air brake on tender and for train; 9½ in. air pump.
Westinghouse air signal.
Three 3-in. Ashton safety valves; 2 open pop; 1 cam lever.
Boiler lagged with Sall Mountain asbestos.
Dean's improved sand feeding device.
Kewanee reversible brake beams.
McIntosh blow-off cock.
Headlight, Star, 16-in. round case.

Railroad Instruction at Purdue University.

Purdue University has for several years offered work covering a considerable variety of railroad subjects, but, recently the plan of existing work has been revised and extended until there are now offered, for the year beginning Sept. 15, 1897, 11 systematic courses and a series of special lectures. Courses numbered 1 to 4 inclusive, are open to regular students in Mechanical Engineering, 5 to 8 inclusive, to regular students in Civil Engineering and 7 to 11 inclusive, to all engineering students. All of these courses are open to graduate students. They are as follows:

1. *Railroad Equipment.*—Recitations and lectures on locomotive construction, principles of locomotive design, a comparative study of locomotive details, car design, train brakes and signals, and car lighting, heating and ventilating.

2. *Locomotive Performance.*—An analytical study of the performance of simple and compound locomotives as shown by the results of road and shop tests, and a study of conditions affecting locomotive efficiency.

3. *Laboratory Work.*—

(a) Locomotive testing involving practice in taking all observations incident to complete efficiency tests of locomotive Schenectady, and in working up observed data obtained from such tests; also tests of Purdue's Baldwin compound locomotive engine.

(b) Locomotive tests in series arranged for the purpose of showing the effect upon the efficiency of the machine, of changes in the proportion of parts and of changes in adjustment or of conditions.

(c) Tests to determine the performance of air pumps, of several elements of the Westinghouse brake system, and of systems of car lighting.

4. *Locomotive Design.*

5. *Railroad Surveying.*

6. *Railroad Construction.*

7. *Economics of Railroad Location.*

8. *Laboratory Work.*—Tests to determine the strength and other physical properties of various elements common to railroad construction, such as links, pins, turn-buckles, axles, channels, rails and rail joints; also tests of standard specimens of different constructive materials.

9. *Railroad Chemistry.*—Lectures and laboratory practice concerning the general applications of chemistry to railroad interests.

10. *Railroad Economics.*—Lectures on the industrial importance of the railroad management, organization, rates and public opinion.

11. *Sanitation.*—A study of the sanitary conditions of cars and stations; preparation for emergencies and health of employees.

In addition to the preceding courses which will be administered by members of the university faculty, a series of lectures will be given by men in practice on subjects relating to their departments. These will be open to all engineering students. The following is a partial list, arranged alphabetically, of those who will take part in this course during the school year of 1897 and 1898.

Jacob N. Barr, Superintendent Motive Power, C., M. & St. P. Ry. Co. (Subject to be announced.)

J. T. Brooks, Second Vice-President Pennsylvania Lines, Problems in Management.

Frederic A. Delano, Superintendent Freight Terminals, C., B & Q. Ry. Co., Signaling.

Frank G. Darlington, Superintendent P., C., C. & St. L. Ry. Co., Indianapolis, The Management of Men.

Charles B. Dudley, Chemist, Pennsylvania R. R. Co., The Application of Chemistry to the Railroad.

Addison C. Harris, Attorney at Law, Indianapolis, Railroad Law.

Melville E. Ingalls, President of the Big Four, Railroads: Their Past, Present and Future.

George K. Lowell, General Superintendent L., N. A. & C. Ry. Co., Practical Points in Operation.

John W. Noble, ex-Secretary of Interior, The Mutual Obligations of Railroad Corporations and the People.

Robert Quayle, Superintendent Motive Power and Machinery, C. & N. W. Ry. Co., Business Problems of the Motive Power Department.

Godfrey W. Rhodes, Superintendent Motive Power, C., B. & Q. Ry. Co., Aurora, Ill. (Subject to be announced.)

Angus Sinclair, Editor *Locomotive Engineering*, Reminiscences of a Locomotive Engineer.

Arthur M. Waitt, General Master Car Builder, L. S. & M. S. Ry. Co., Car Designing and Construction.

Railroad and Industrial Improvements in Japan.

We have noted in these columns from time to time, during the past several months, arrivals in and departures from the United States of Japanese government and private railroad officials, engineers and merchants, whose objects were to investigate the operating, mechanical, traffic and legal departments of the railroads of this country and Europe and the various methods of making iron and steel, machinery, cars and locomotives. As a matter of course we have received these gentlemen with that ready hospitality which Kipling apparently thinks even too free:

"His easy, unswept hearth he lends
From Labrador to Guadaloupe;
Till elbowed out by sloven friends
He camps at sufferance on the stoop."

At any rate, our railroads expected no return from these gentlemen, except, perhaps, acknowledgements of courtesies received or a little free advertising, which they probably got. But with our manufacturers it was different. Dealers in railroad supplies, equipment and machinery expected orders of more or less importance. They were, with few exceptions, disappointed; and this fact has led some of them to mistrust the Japanese and to charge them with stealing our ideas. Perhaps they were sometimes justified. To prevent this, manufacturers were told to protect their patents by taking out papers in Japan. This some endeavored to do, but found that no law in that country afforded them full protection. Treaty arrangements, however, have lately been concluded whereby this objection is now removed.

Considerable progress is being made by Japan toward putting its railroads and railroad works on a level with those in the western countries and we learn that more representatives of these industries will shortly leave Japan

for a tour of the world and that the Japanese government has decided to send each year two engineers, probably one civil and one mechanical, on similar missions. There are now two car-building works in Japan devoted to building cars for private railroads (the cars of the Imperial Railroad system being built by the government). Both of these are at Tokio. The larger, known as the Hiraoka Works, was established in 1890 by Hiroshi Hiraoka. Mr. Hiraoka visited this country several years ago, served as an apprentice in the shops of the Baldwin, Hinckley and Manchester locomotive works, and subquently took a course in engineering in Harvard University. He again returned to Japan and entered the service of the Imperial Railroad, serving for over 10 years, the last seven, 1883 to 1890, as Car and Locomotive Superintendent. For five years, until December, 1895, part of the government barracks was used for the Hiraoka Car Works. In that month construction of new works was begun, and they were completed in March of the following year.

The entire plant covers about two acres of ground and consists of about a dozen buildings, the erecting, painting, blacksmith, wood-working, machine and pattern shops, boiler works, foundry, store-rooms and engine-rooms occupying separate buildings. All are of wood excepting the foundry and engine-room, which are brick. The plant is equipped to build both freight and passenger cars and cost in all about $150,000. Most of the machinery was brought from England. About 700 persons are employed.

Last year the works built a little over 500 cars, about two-fifths of which were for freight service; of the balance, all passenger cars, 150 were for the Nippon Railroad. The works now have contracts for building 600 freight and passenger cars for various roads. The iron works, which are a part of the plant, turn out frogs and switches, signal castings, girders and other material for bridges.

The building of the plant was superintended by Mr. T. Hiraoka, a brother of Mr. Hiroshi Hiraoka, who is now in New York City. He has visited the principal cities of this country and England, and is now on his way back to Japan, via Vancouver. He will leave New York about the middle of April and visit all the large railroad, car and locomotive shops, as well as the manufacturers of shop machines and tools between here and Chicago.

Mr. Hiraoka is a graduate of the commercial college at Tokio and was connected with the Nippon Railroad as Storekeeper and Purchasing Agent, resigning in December, 1895. The object of his visit is to investigate for the Nippon Railroad the standards used in car and locomotive construction, and the knowledge he acquires will of course be applied to the building of cars at his brother's works. His report will also be used in an endeavor to get the railroads of Japan to organize an association similar to our Master Car Builders' and Master Mechanics' associations and to establish standards. The railroads, which are all narrow gage, make little effort at uniformity either in equipment, construction or operation. Cars seldom leave their own road, so that a lost car department is a thing unknown in Japan. Mr. Hiraoka is also arranging to represent certain large supply-houses in connection with his brother's works.

In addition to the two car building works at Tokio, eight more are contemplated; three at Tokio, two in Nagoya and three in Osaka. Some of these are fairly under way while others have only just completed organization. These will all be built by different parties, but steps are being taken by some toward consolidation. Some of these companies contemplate building both cars and locomotives. The use of sleeping-cars is also to receive serious consideration; in fact, it may be said that some of the roads have practically decided to use them.

Some Studies in Speed and Acceleration of Various Motors.

BY GEO. L. FOWLER.

(*Concluded from Page* 205.)

Express Service.—After the cable and electric and air motors, the locomotive is the only remaining competitor for rapid transit. It has been in service for so long a time, and the demands made upon it have been so great that it is most natural that its speed and capabilities should be more highly developed than that of the other means considered last week. The service performed by the locomotive may be divided into three classes, that of the high-speed express, the suburban local and the elevated railway service. Accordingly speed records have been taken on trains representing each type.

The express service chosen was that of a Royal Blue Line running between Philadelphia and Jersey City, over the tracks of the Philadelphia & Reading R. R. to Bound Brook, and thence over the Central of New Jersey to the terminal. The train was composed of five cars—a combination baggage and smoking-car, two day coaches and two parlor cars, and was hauled by a four-cylinder compound locomotive having cylinders 13 in. and 22 in. in diameter with a stroke of 24 in. The weight of the train was as follows:

	Lbs.
Locomotive	129,000
Tender (loaded)	75,000
Combination car	53,800
Coaches (53,950 lbs. each)	107,900
Parlor cars (75,000 lbs. each)	150,000
Total weight of train	513,700

The distance from the Reading Terminal to the Jersey City Depot is variously given. The railroad schedules have 90.2 miles; the speed indicator tallied 90.3 miles and the station surveys make it 90.03 miles. The latter would naturally be taken as correct were it not for an uncertainty existing as to the exact point of junction of the two lines. Taking 90.2 as the correct distance, which is a convenient mean between the other two, the running speed of the train between the two terminals was almost exactly 49 miles per hour (48.996). The time that the train was in motion was 1 hour 50 minutes 25 4 seconds. Five intermediate stops were made—at Spring Garden street, Columbia avenue, Wayne Junction, Jenkintown and Trenton Junction, at which 1 minute 34.6 seconds were lost, or an average of 18.92 seconds for each stop. The speed of the train was slackened four times—twice to take water, once for the Bound Brook yard and once for the Newark Bay drawbridge. The highest speed reached was 69½ miles per hour, but this was only reached and not maintained for an appreciable distance, and the fastest time that was taken between mile posts was 53 seconds, or 67.92 miles per hour. The steam pressure on the boiler averaged about 170 lbs. per square inch.

The most noticeable feature of the diagram of this run, Fig. 7, is the close agreement between the lowest points of the grades and the cessation of acceleration of the train.

In the diagram the figures placed in connection with the profile line indicate the gradient in feet per mile; the horizontal full and dotted lines represent an elevation of 20 ft. each for the profile and a speed of five miles per hour for the speed curve, and the vertical lines in this, as in all the other diagrams of the series, are one mile apart. As the difference in the elevation of the two terminals is but 56.71 ft., or, if we estimate it from the foot of the elevated structure, just beyond Spring Garden street, the difference drops to less than 27½ ft., we may consider that for all practical purposes the road to be level as far as the total amount of fall in elevation is concerned.

This train then ran over a track between terminals of practically the same elevation at a speed of 49 miles per hour. Owing to the location of the tracks, the stops and the slowing down, it was, of course, necessary that a much higher speed should be maintained over stretches of considerable length, and as there were points when the train was slightly behind the schedule, the acceleration and speed curve may be taken to closely approximate the capacity of this engine on that track with the train it was called upon to haul. The rails were dry, the air clear and a stiff westerly wind blew against the side of the train to the point where the speed was checked at the Delaware River, after which it blew in the direction of the motion of the train.

The first point at which the engine was worked for an acceleration was upon leaving Wayne Junction. Here there was a favorable grade of 20.22 ft. to the mile, or .38 of one per cent. At the foot of this grade, which has a length of about 10,000 ft., the train had reached a speed of 49.25 miles per hour. The rate of acceleration at which this speed was reached was as follows:

	Ft.
Distance run to attain a speed of 5 miles per hour	52 (?)
" " " " 10 " "	105 (?)
" " " " 15 " "	369
" " " " 20 " "	786
" " " " 25 " "	1 066
" " " " 30 " "	1 584
" " " " 35 " "	2,468
" " " " 40 " "	4,012
" " " " 45 " "	6,979
" " " " 49.25 " "	9,712

It will be noticed, however, that the speed fell away the moment the foot of the grade was passed, dropping to 42.25 miles an hour at the top of the next grade.

The next point at which the capabilities of the engine are best shown is on the run out of Jenkintown. Here for a distance of something more than 15 miles, there was a constant acceleration or loss of speed that was exactly coincident in its changes with the changes of the profile, and it was here that the highest speed reached on the trip was attained. Starting from Jenkintown, there was a sharp rise for a short distance, followed by a favorable grade, a climb, a drop and a second adverse grade. If we follow the same method as that pursued in the plotting of an acceleration curve for the electric cars, and take the acceleration out of Jenkintown up to the point where a speed of 65 miles an hour was reached and then project across to the next wave of the curve, by which means the locomotive is favored to the greatest possible extent, we obtain the following schedule:

	Miles.	Ft.
Distance run to attain a speed of 5 miles per hour.		52 (?)
" " " " " 10 " " "		105 (?)
" " " " " 15 " " "		648
" " " " " 20 " " "		1.4?4
" " " " " 25 " " "		2.582
" " " " " 30 " " "		3,780
" " " " " 35 " " "		4,752
" " " " " 40 " " "	1	607
" " " " " 45 " " "	1	1,?49
" " " " " 50 " " "	1	3,685
" " " " " 55 " " "	2	694
" " " " " 60 " " "	2	3,050
" " " " " 65 " " "	3	1,551
" " " " " 69.5 " " "	4	1,672

Thus we see that it required about 4⅛ miles to reach a speed of 69½ miles per hour upon a down grade for the whole distance, with the exception of the first 3,565 ft. where the speed was the lowest and the effect of grade least felt, although this did check the acceleration for the distance run up grade in comparison with that out of Wayne Junction, where the grade was more favorable from the start by about 30 per cent.

It is very evident, too, that the speed of 69½ miles per hour, that was reached at the foot of the grade, was more than the engine could maintain with its train on the level, for as soon as the level track was reached the speed began to decrease and dropped to about 64¾ miles per hour in a distance of 7 200 ft. As soon as the ascending grade was reached the speed decreased still more rapidly and at the top, after a run of 3 miles 2,335 ft. up a grade averaging 20.33 ft. to the mile (.38 per cent.), the speed had fallen to 48½ miles per hour. It is evident

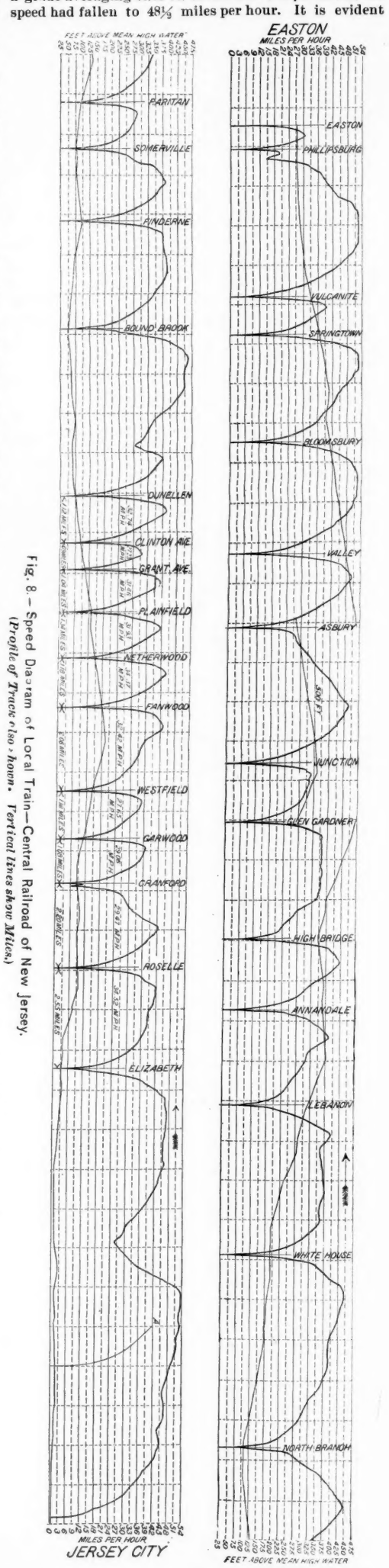


Fig. 8.—Speed Diagram of Local Train—Central Railroad of New Jersey. (Profile of Track also shown. Vertical lines show Miles.)

from this that 70 or even 65 miles an hour is a higher speed than the engine can maintain, with this weight of train on a level and that 60 miles an hour cannot be maintained on a moderate adverse grade.

For the speed actually maintained on a level there is a section of the run beyond Trenton Junction that affords

an approximate example of it. The points *A* and *B* are at the same elevation and the speeds at which they were passed were the same. They are distant from each other 3 miles and 3,065 ft. There is a down grade of 7.02 ft. to the mile (.13 per cent.), followed by an adverse grade of 8.97 ft. to the mile (.17 per cent.), and ending in a level 3,250 ft. long. The speed at *A* and *B* is the same, 48.75 miles per hour, rising to 52½ miles near the foot of the sag. It would not be accurate, however, to take this as the limit of the engine's capacity.

There is another point further on where the performance is still better. At *B*, after crossing the Raritan River, a speed of 55 miles an hour had been reached.

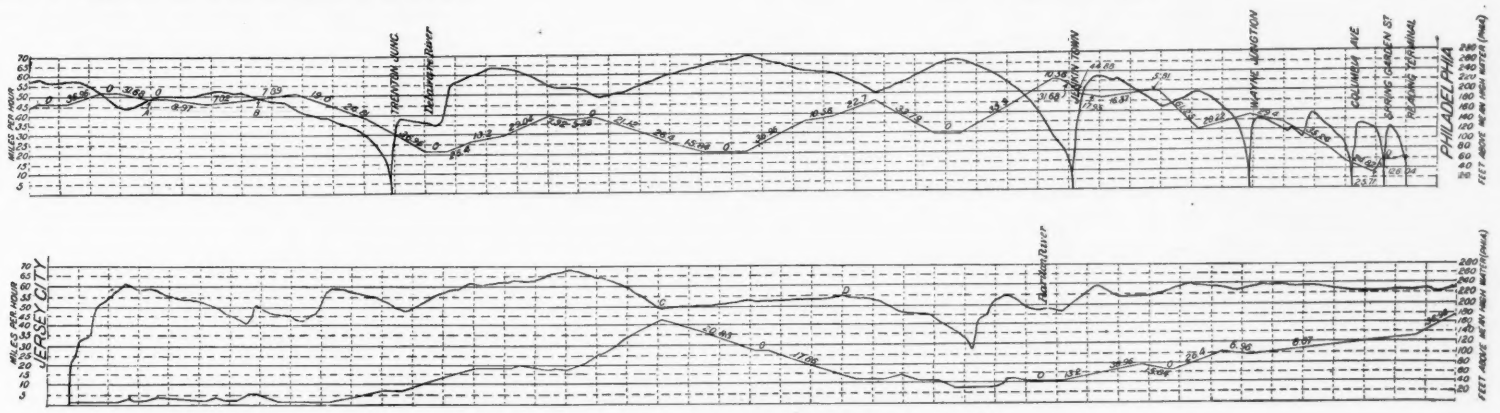


Fig 7.—Speed Diagrams, Royal Blue Train, Philadelphia to Jersey City.

(The Profile of the Track is also shown. Vertical Lines show Miles.)

This was at the foot of a grade that averaged 18.55 ft. to the mile (.35 per cent.) for a distance of about 6¾ miles. At the summit of the grade the speed had dropped to 49 miles per hour. The resistance on this grade due to the lifting of the load was 1,750 lbs. If we use the ordinary Clark formula the resistance of the train at 55 miles an hour was about 6,600 lbs.; at 50 miles it was 5,800 lbs. It will be noticed that just before reaching *C* the speed line is horizontal at 50 miles an hour, showing that there at least the motive power and the resistances were nearly if not perfectly balanced. If, then, we take the train resistance at 50 miles an hour and add to it the resistance due to grade we have

$$5,800 + 1,750 = 7,550 \text{ lbs.},$$

which may be taken to be approximately equal to the power of the engine, and which corresponds to a train resistance at a speed of 59¾ miles an hour. It is probable therefore that we are not far from the truth in placing the capacity of this engine with this weight of train at 60 miles per hour on a level track. But as if this is the utmost limit, it would theoretically take an infinite distance to attain this speed on a level track so that the actual limit of the engine should be placed somewhat lower. In fact it is probable that the schedule time of the train, as it has already been given, is very close to the maximum working capacity of the engine.

Local Service.—It is, however, in a local service that the interest in rapid suburban transit centers, and the accompanying diagram, Fig. 8, is a reproduction of that taken on a local train on the Central Railroad of New Jersey, running between Jersey City and Easton, Pa. The locomotive had cylinders 18 in. diameter by 24-in. stroke, and weighed with the tender 182,650 lbs. The train consisted of four cars, a baggage and express and three coaches, the total weight of which is estimated at $140,000 lbs., making the total weight of the train 322,650 lbs. The distance from Jersey City to Phillipsburg is about 72.3 miles, and the actual time during which the train was in motion was 2 hours 20 minutes 17 seconds, having been standing 9 minutes 43 seconds, or an average of 30.46 seconds at each station. The average running time was 29.08 miles per hour. As the stations on a local train are supposed to be within two miles of each other, that portion of this run where the distance between stations is greater and where higher speeds were attained than would have been possible with the shorter station distances will be ignored in the final consideration. The following table shows the average distance covered upon leaving the stations in order to attain the speed given up to 42 miles per hour:

							Ft.
Av. distance run to attain a speed of				3	miles per hour..		25 (?)
"	"	"	"	6	"	"	.. 55 (?)
"	"	"	"	9	"	"	.. 101
"	"	"	"	12	"	"	.. 201
"	"	"	"	15	"	"	.. 322
"	"	"	"	18	"	"	.. 489
"	"	"	"	21	"	"	.. 680
"	"	"	"	24	"	"	.. 1,078
"	"	"	"	27	"	"	.. 1,488
"	"	"	"	30	"	"	.. 2,282
"	"	"	"	33	"	"	.. 2,754
"	"	"	"	36	"	"	.. 3,494
"	"	"	"	39	"	"	.. 4,468
"	"	"	"	42	"	"	.. 5,347

These distances are averages of the 29 starts made from a stop on the whole run, and they are plotted at *A* on the diagram between Jersey City and Elizabeth. The uniformity in the curvature of this line is so even that it will probably not be far out of the way to consider it as the acceleration curve of this train upon a level track.

In the purely local traffic it is well to limit ourselves to the consideration of the work done where the station distances do not average more than two miles, as when distances are greater than this the speeds may run up to those attained by express trains. The portion of the run which fulfills this condition is that between Elizabeth and Dunellen. The distance is 14.44 miles, divided into 10 station intervals, making an average of 1.444 miles. The actual distances between stations is given near the bottom of the diagram. Three out of the ten intervals are more than two miles in length, and on these we notice the effects of the grade and other causes in influencing and varying the speed; but in the other seven intervals the similarity of the curves is very marked despite the fact that they were formed both on favorable and adverse grades. There is a continued acceleration up to the maximum speed, a short run with decreasing speed with the steam shut off and then the rapid checking of the motion due to an application of the brakes. The highest average speed between these stations was that attained between Elizabeth and Roselle, where it was 34.52 miles per hour, and where the distance is the greatest. The highest actual speed touched was between Fanwood and Netherwood on a favoring grade and was 43.95 miles per hour. The average for the whole distance was 31.39 miles per hour. As this average is only for the actual running time, that lost at the several stations should be added in order to get the time-table average. On this particular train it amounted to 4 minutes 56.8 seconds, so that the average time of the train from the stop at Elizabeth to the stop at Dunellen is cut down to but a trifle more than 26 miles an hour, thus clearly showing the importance of reducing station delays to the lowest possible point.

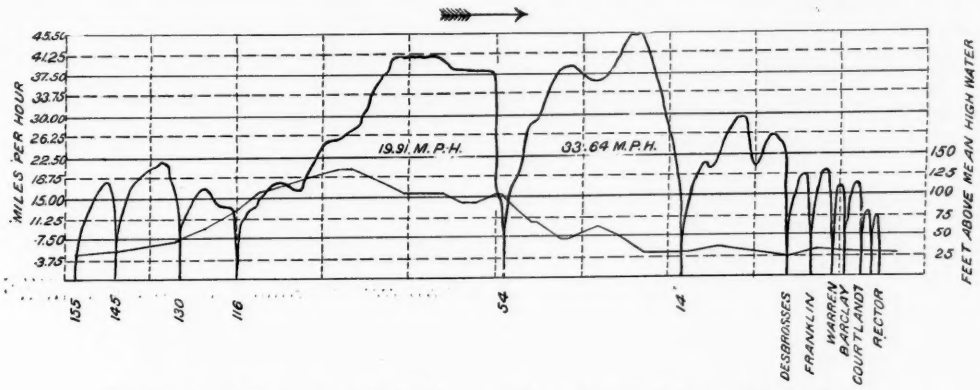


Fig. 10 —Speed Diagrams and Profile Manhattan Elevated, by Ninth Avenue—Express Train.

(Vertical lines show miles.)

As the acceleration curves between these stations will give almost the same average as those for the whole line as plotted at *A*, it will be seen how difficult, if not quite impossible, it would be for this train to make an average running time of 30 miles an hour when the stops are less than 2 miles apart, unless an engine that is out of all proportion, as we now consider proportions, to the weight of the train and the grades to be overcome, is used.

Manhattan Elevated Railroad.—While a rapid transit for the city of New York may well embrace every means of transportation in use, it is usually associated, in the mind of the public, with the facilities offered by the Manhattan Elevated Railroad and those promised by the plans of the Rapid Transit Commission. Figs. 9, 10, 11 and 12 are diagrams taken from a number of trains on this road, and are are illustrative of the services there rendered. The trains on all of these runs consisted of an engine of the Forney type, having cylinders 11 in. in diameter and 16-in. stroke, and weighing in working order 37,580 lbs., and five coaches each weighing 29,300 lbs. each, or a total of 184,080 lbs. for the whole train. All of the runs were made on the west side line between 155th street and South Ferry, via Ninth avenue.

Fig. 9 is a reproduction of a diagram taken on a local train going south. It will be noticed that the curves of acceleration are very similar for each start. Referring to Fig 9, the notches shown in the curves between 116th and 104th streets and between Fourteenth and Christopher streets were caused by slowing for curves and that between Fifty-ninth and Fiftieth streets by the Fifty-third street junction.

As in the diagrams illustrating the runs on the Philadelphia & Reading and the Central Railroad of New Jersey the acceleration curves show the effects of grades, and this is especially the case with the express train diagrams of Figs. 10 and 11. If, however, we take all of the starting curves an average of the whole will give us the following schedule:

							Ft.
Distance run to attain a speed of				3¾	miles per hour..		40 (?)
"	"	"	"	7½	"	"	.. 67
"	"	"	"	11¼	"	"	.. 219
"	"	"	"	15	"	"	.. 446
"	"	"	"	18¾	"	"	.. 762
"	"	"	"	22½	"	"	.. 1,002
"	"	"	"	26¼	"	"	.. 1,614
"	"	"	"	30	"	"	.. 3,070
"	"	"	"	33¾	"	"	.. 4,013
"	"	"	"	37½	"	"	.. 4.860
"	"	"	"	41¼	"	"	. 4,600

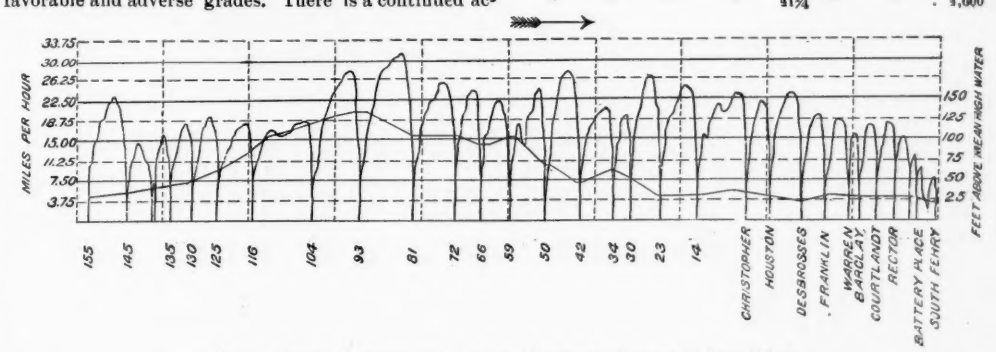


Fig. 9.—Speed Diagram and Profile Manhattan Elevated—Local Train.

(Vertical lines show miles.)

The last figure is, of course, an absurdity, and is due to the fact that the 41¼-mile line was only crossed once, and that on a down grade where the acceleration had been very rapid. It is probable that the distance given for 37½ miles an hour is also too low.

These distances have been plotted in the curve *A* in

Fig. 13. It will be seen that the curvature is reversed for the rise between 37½ miles an hour and 41¼ miles which could not possibly occur in practice. As the actual distance for 37½ miles is probably too short, the curve has been plotted with a dotted line from 33¾ miles, an hour to 37½ miles and this with the solid line rising to it may be taken to represent very closely the capabilities of these engines to accelerate a train of the weight used upon a level track. From the angle at

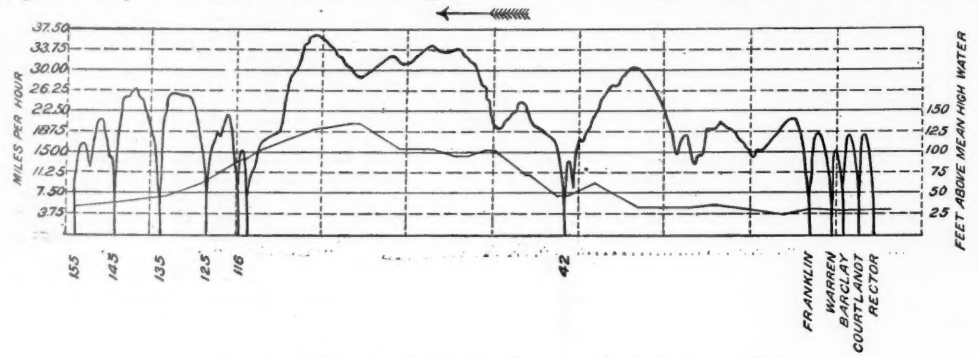


Fig. 11.—Speed Diagrams and Profile, Manhattan Elevated—Express Train.

which the curve approaches the 37½ mile mark this may well be taken as the limit of capacity of these engines and upon adverse grades it would, undoubtedly, be impossible for them to maintain even that speed.

The highest speed attained was by the express running south (Fig. 10) and was 45 miles an hour at the foot of a steep grade; 41 miles was reached at another point and maintained for a short distance on a level, but, as has already been said, it could probably not have been attained at all had it not been for the assistance of the grade.

Fig. 12 is a diagram taken on a wild train making no stops and running between locals. It shows graphically the comparatively low average speed, despite the high speeds actually attained between stations by local trains.

In a service like that of the Manhattan Elevated Railroad the time lost at stations is an important detriment to making fast time. An average of 169 observations on local trains on the Sixth and Ninth avenue lines gives a station stop of 13.4 seconds, and 49 stops on express trains gave an average of 26.5 seconds, the longer stop of the express being due to the excessive crowding and blocking of both the station and car platforms whereby the movement of the passengers was impeded.

The running time of local trains from 155th street to South Ferry is 45 minutes and the distance is 10.02 miles. The average rate of speed therefore including 26 stops is 13.36 miles per hour. If we allow the average rate for these stops, we have 5 minutes 48.4 seconds, so that the average speed of the train while in motion is 15.72 miles per hour.

The schedule time of the express trains is 32 minutes from 155th street to Rector street and the distance is 9.49 miles. The running time, therefore, including 10 stops, is at the rate of 17.77 miles per hour. Of these 10 stops only eight are station stops, the other two, at Fifty-fourth and Fourteenth streets, are for switches and may be taken to average 5 seconds each. The loss of time, then, for all stops is 4 minutes and 10 seconds. Deducting this from the running time we have an average speed of the train while it is in motion of 20.46 miles per hour, with a maximum speed of more than double this average. The train is handicapped by two extra stops and the necessity for slowing on grades and curves. If, then, the time between the business section of the city and Harlem is to be lowered some change must be made, as higher actual speeds with the engines now in service is probably out of the question.

In order to show the limit of the capacity of the engine now used, a profile (Fig. 13) of the road from South Ferry to 155th street has been plotted, to which has been added that of the Putnam Division of the New York Central & Hudson River Railroad, from 155th street to Yonkers. The total distance is 18.22 miles. In connection with this profile a speed diagram has been plotted, showing what might be accomplished with the elevated railroad locomotives, provided the water supply of the tanks was to be made sufficient for the run.

In plotting this diagram, use has been made of the actual diagrams taken and these have been copied and fitted into place wherever it has been possible. Due allowance has also been made for all curves and adverse grades, while the advantage taken of favorable grades is well within what they would actually afford. If trains were to be run on this schedule the average speed from Rector street to 155th street, exclusive of the three station and one switch stop would be 20.86 miles an hour or 1.40 mile faster than the present schedule. On the Putnam Railroad there is a long stretch of level followed by an adverse grade. If the train speed is plotted from the data given in the diagrams with a maximum of 33¾ for the level the speed between 155th street and Yonkers will drop to 24 miles an hour while that at present obtained with the heavier engines used on the surface road is about 27 miles an hour. It would, therefore, appear that the limits of speed on the elevated railroads has about been reached and that if the time is to be cut down it must be done with heavier engines and no material increase in the weight of the train.

In the light of this information, the reduction of the running time from Rector street to 155th street to 20 minutes, as has been urged, will necessitate a through run without any stops at an average speed of 25.44 miles an hour, which is hardly within the capabilities of the present equipment and would involve the abolition of all slowing down for curves and switches, the construction of a third track from Warren street to Fourteenth street, in order to clear local trains, and a clear track on the single line from 116th street north where, on account of the island platforms, the expresses must, at present, run at local speed. If, however, the present engines were to be used, the addition of the third track from Warren street would enable the management to cut the time by about five minutes.

The plotting of the acceleration curves for all of these motors from the same point on a base line makes an intricate network of lines that is simply confusing. Of course, acceleration is a matter of resistance and power, and with the same conditions the same results will be obtained. But it appears from this slight investigation of the subject that the resistances of the various motors and their trains do not increase in the same ratios, so that while the acceleration of one may fall off at the start it may overtake and pass a rival at a higher speed. The following table, which omits the horse and cable cars, gives the order in which the various motors stand in their acceleration of the various loads with which they were measured.

The order in which the motors stand at 17½ miles an hour is that maintained for all higher speeds with the mere dropping out of one after another until only the Philadelphia & Reading remains.

The figures given in this article cannot be taken as the ultimate limit attainable by any one of the several types of motors tested; but, as all of them were driven, at the time the diagrams were taken, well up to their capacity it is probable that their capabilities are very closely shown. If higher speeds are to be attained or greater power is to be exerted there must be a modification of some of the elements now affecting their operation, for which innumerable suggestions have been made and which will probably continue to appear with periodical regularity.

COMPARATIVE RATES OF ACCELERATION.

	Speed in miles per hour.				
	5	10	12½	15	17½
1.....	Hardie Motor.	No. Hud. Co. Elec.*	Hardie Motor.*	No. Hud. Co. Elec.*	No. Hud. Co. Elec.*
2.....	No. Hud. Co. Elec.*	Hardie Motor.	No. Hud. Co. Elec.	Central of N. J.	Central of N. J.
3.....	Nassau Elec.	Phila. & Reading.	Central of N. J.	Nassau Elec.	Manhattan.
4.....	Central of N. J.	Central of N. J.	Nassau Elec.	Manhattan.	Hardie motor.
5.....	Phila. & Reading.	Nassau Elec.	Manhattan.	Hardie motor.	Phila. & Reading.
6.....	Manhattan.	Manhattan.	Phila. & Reading.	Phila. & Reading.	Nassau Elec.

* Down grade.

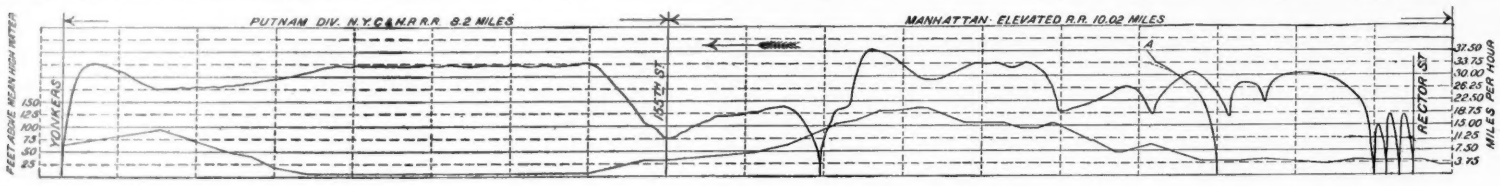


Fig. 13.—Hypothetical Diagram of a Run of an Express Train from Rector Street to Yonkers; From Data Obtained on the Manhattan Elevated.

(The Profile of the Track is also shown. Horizontal Intervals Represent Miles.)

Locomotive Tests for the Illinois Central.

Prof. L. P. Breckenridge, head of the Department of Mechanical Engineering of the University of Illinois, has completed arrangements with Mr. William Renshaw, Superintendent of Machinery of the Illinois Central Railroad, for a series of locomotive road tests, the work to be done by the students of the university, under the supervision of Professor Breckenridge. The engines selected for the tests are two new eight-wheel, 18 in. × 26-in passenger locomotives, which were illustrated in the *Railroad Gazette* of Feb. 5; four 18 in. × 24-in. eight-wheel passenger locomotives which were built by the Brooks Locomotive Works some time ago; one 19 in. × 26-in. mogul, and one 21 in. × 24-in. consolidation locomotive.

The work will be begun about the middle of April, and such observations will be taken as are necessary to determine all the usual quantities for complete engine and boiler tests. In addition to the comparative performance of the various types of engines it is expected that much valuable information will be obtained regarding the steam distribution of different valve gears for all grades of expansion at various speeds.

The tests will be conducted in such a manner that the data obtained will be as accurate as possible and of value to the Illinois Central road; on the other hand the benefit to be derived by the university will be in its ability to offer to the students of mechanical engineering an opportunity to take part in practical work of the highest importance. The apparatus and rigging needed for the tests is now being applied to the locomotives by Mr. J. H. Pollard, Master Mechanic of the Illinois Central at Centralia, Ill.

In view of the fact that Professor Breckenridge has had considerable experience in locomotive testing on the Lehigh Valley, and that exceptional opportunities are offered by the Illinois Central officials, it is reasonable to expect that much new and reliable data will be obtained.

Electricity on the "Alley L," Chicago.

Arrangements are now being made for the long-considered change of the motive power from steam to electricity on the South Side Elevated Railroad of Chicago, known as the "Alley L." The plans are being made by the firm of Sargent & Lundy, Electrical and Mechanical Engineers, of Chicago, who will act as consulting engineers for the railroad company, and will superintend the construction.

The estimated cost of making the change is approximately $1,500,000 and it will require six months to complete the work, portions of which will be commenced about April 1. The connection with the Union Loop will be through Harrison street to Wabash avenue, an ordinance having been passed by the Chicago City Council granting the "Alley L" the right to erect an elevated structure in this street. The work will not be let to a general contractor, but the railroad company will itself let separate contracts for the various portions of the work.

The third-rail system, virtually the same as that on

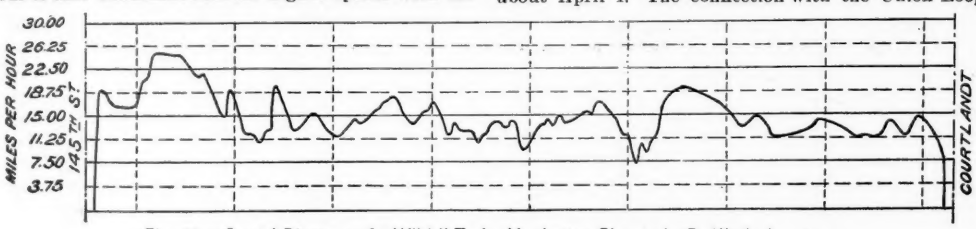


Fig. 12.—Speed Diagram of "Wild" Train, Manhattan Elevated—By Ninth Avenue.

the Union Loop, will be used for carrying the current, although some of the minor details, such as the insulators, will be different. The third-rail will be fed by 18 feed-wires, which will consist of bare copper cables carried in a feeder-box between the two tracks. The Metropolitan West Side Elevated Railroad now uses bonded rails for feeders.

The plan is to alter the present cars of the "Alley L," putting on new trucks and thus fitting them for use as motor cars, though a few new motor cars will be purchased. The type of motors, trucks, new train schedule and many other such details, have not yet been considered.

One power house will be erected, which will be centrally located. This will be a building of steel frame construction, faced with brick. The engines will be compound condensing, with a total capacity of 5 000 H. P.; the boilers will be of the water-tube type, and the generators direct-connected machines. The voltage at the power station will be 650 volts, that of the third rail from 600 to 625 volts.

When electricity is used it is the intention to run trains at shorter intervals than heretofore.

Recent Heavy Tools—Built by the Niles Tool Works.

The Niles Tool Works, Hamilton, O., bas recently built some heavy special tools, which are shown in the accompanying illustrations.

Fig. 1 shows a set of large bending rolls built for the United States government. This machine consists of two heavy housings 25 ft. 2 in. apart united at the top by two 15-in. I-beams, and below by two heavy side-frames. The tops of the side frames are turned in level so as to form a table, about 2 ft. wide on each side and 2 in. below the top of the lower rolls.

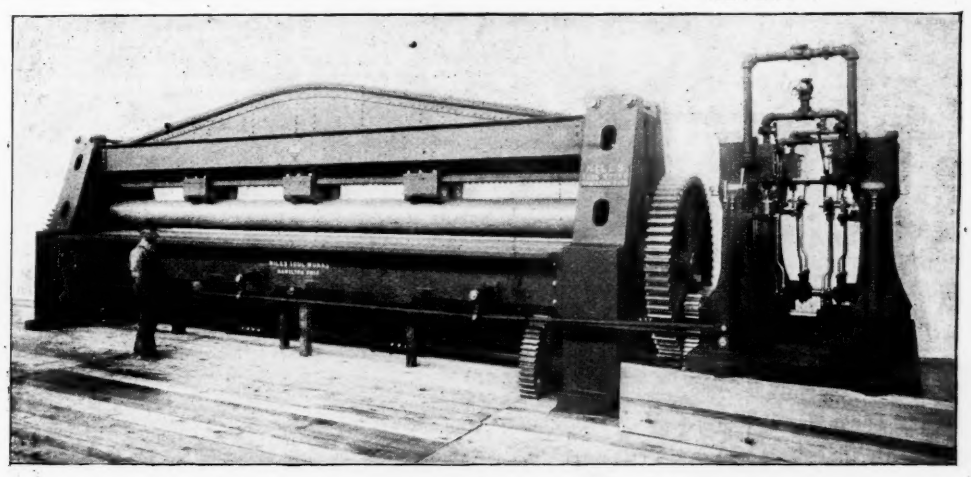


Fig. 1.—Bending Rolls Built by the Niles Tool Works.

The rolls are three in number, one upper and two lower, each 25 ft. long. The lower rolls are each 14 in. in diameter, with centers 18 in. apart, while the top roll is 16 in. in diameter. Both the upper and lower rolls are re-enforced rollers 6⅞ in. in diameter placed in pairs, there being three pairs to each roll. The lower supporting rollers are carried on the side-frames, while the upper ones are directly above and attached to the under side of a heavy plate girder.

The lower rolls are connected by means of heavy shafts and spur gears to a pair of 8 × 10-in. vertical engines; the engine shaft runs at 324 revolutions per minute, which speed is reduced 120 times by the gears driving the rolls.

The upper roll is adjusted by a heavy vertical screw at each end, operated by a worm and bevel gearing; the shaft is so arranged with clutches that either end can be raised or lowered independently or both together; the gears governing the vertical movements are driven by a second pair of 8 × 10-in. vertical engines, making 200 revolutions per minute, which gives a motion of about 1¼ in. per minute to either one on both ends.

The engines are at one end of the machine, with levers and handles so arranged that all motions of the rolls are controlled by one operator. The machine is 38 ft. over all and 11 ft. 8 in. high, while the tops of the lower rolls are 2 ft. 6 in. from the floor.

Fig. 2 shows a large boring and facing machine, especially designed for boring the main cylinder ports and frames of Corliss engines, although it is well adapted for miscellaneous boring and facing. This machine is provided with two boring bars, one 14 in. and one 7 in. diameter, each being fitted to a sliding head. The traverse of the 7 in. bar is 8 ft., this being measured from the point of the tool on the facing head next the main column. The main spindle is 8 in. in diameter and has a 60-in. traverse with a sliding bar to bore 60 in.; there are also two port boring bars to bore 5 in. diameter boles.

The maximum distance from the top of the table to the center of the upper boring spindle is 7 ft. 4 in. The table is so arranged that the upper facing head will clear the outer edge of the table when boring small cylinders.

This machine is adapted to boring the cylinder proper and the two ports, simultaneously, of Corliss engines with cylinders ranging in diameter from 14 in. to 60 in., and for diameters from 12 in. to 14 in. It will bore the cylinder and one port at the same time; it is also arranged to face and counterbore the cylinders and turn the flanges of the frames, beside boring the frames for the crossheads. The weight of the tool is approximately 110,000 lbs.

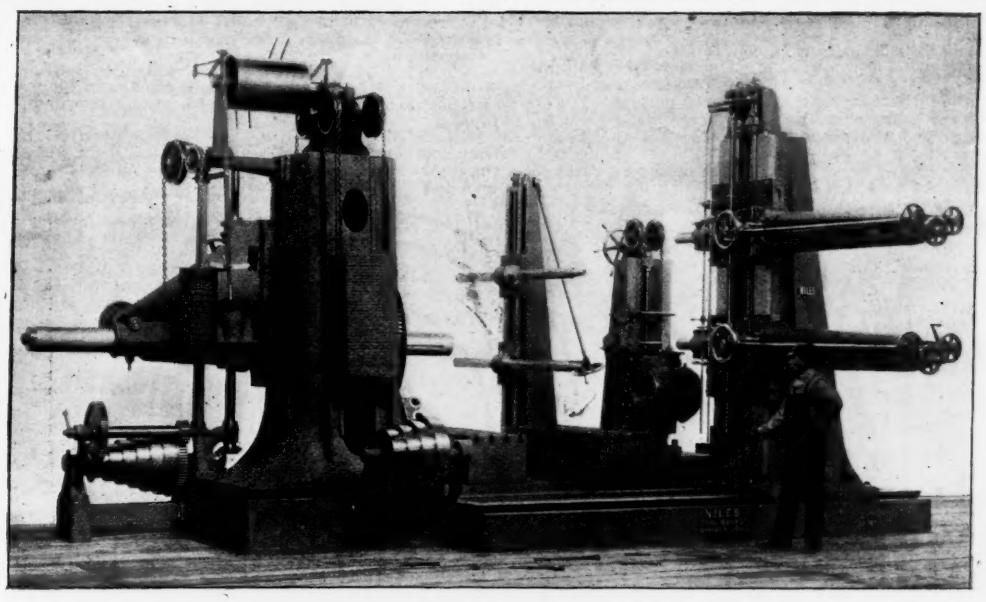


Fig. 2.—Boring and Facing Machine—Niles Tool Works.

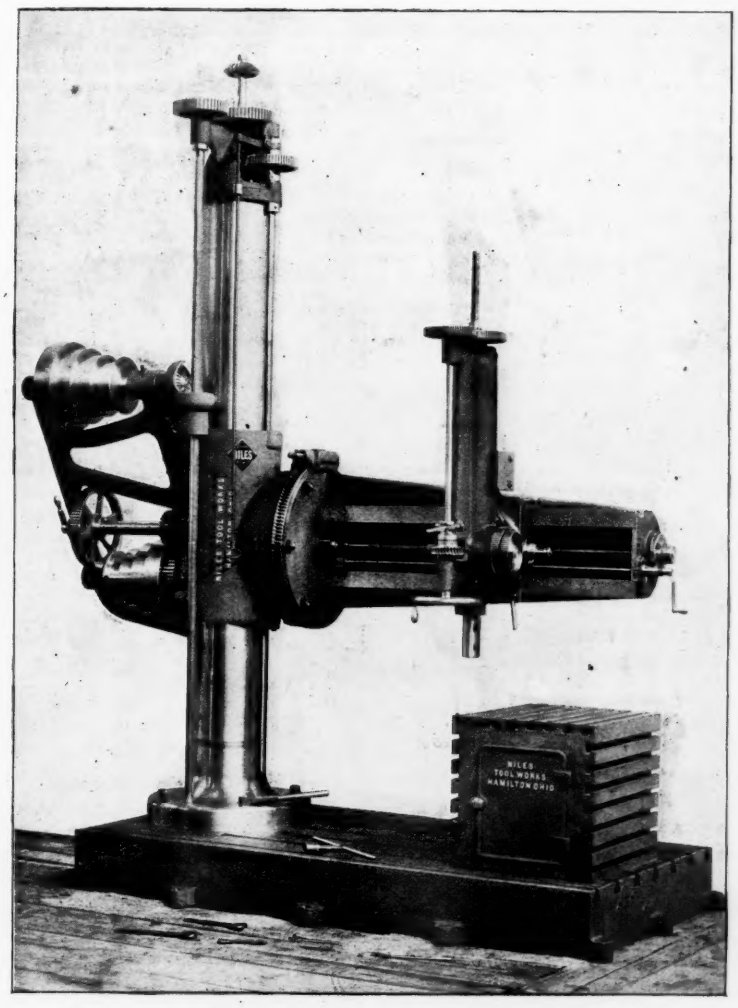


Fig. 3.—Niles Tool Works' Standard Radial Drill.

Fig. 3 shows a standard No. 5 radial drill. It is of the same general construction as the other radial drills built by the Niles Tool Works, but the column is of larger diameter and the arm is of heavier construction; the weight of this tool is over 20,000 lbs.

The length of the arm is 7 ft. 6 in. The greatest distance from the sole plate to the end of the spindle is 7 ft. 6 in., and from the floor to the end of the spindle is 8 ft. 6 in. The table is 28 in. × 28 in. × 28 in. high from the sole plate. The spindle, which is 3¼ in. in diameter, is arranged to take a No. 4 Morse socket, and has a traverse of 20 in.

Train Accidents in the United States in February.

COLLISIONS.

REAR.

2d, on Chicago & Northwestern, at Arlington, S. Dak., an empty engine ran into the rear of a preceding passenger train, making a bad wreck. There was a dense fog at the time. The conductor and 2 passengers were killed and their bodies were burned up, a car of coal on a sidetrack having been wrecked by the collision and subsequently set afire by the coals in the locomotive. Two passengers were injured.

5th, on Fitchburg road, near Buckland, Mass., a passenger train which had been stopped on the main line, in consequence of the failure of its locomotive, was run into at the rear by the engine of a following freight train, wrecking the engine, one passenger car and one freight car. The passengers succeeded in getting out of the car before the collision occurred. A flagman had been sent back, but the freight engine was coming at uncontrollable speed in consequence of the separation of its train into two parts, on a descending grade, which had occurred a few minutes before.

8th, on Baltimore & Ohio, at Confluence, Pa., a passenger train ran over a misplaced switch and into the rear of a freight train, damaging the engine and several cars. The fireman was injured.

10th, 1 a. m., on Union Pacific, at Valparaiso, Neb., a freight train broke in two and the rear portion afterward ran into the forward one, badly damaging 3 cars. Two trainmen were injured.

19th, on Florida Central & Peninsular, near Lake City, Fla., a freight train broke in two and the rear portion afterward ran into the forward one, making a bad wreck. One trainman was killed and another injured.

20th, on Chicago, St. Paul, Minneapolis & Omaha, near Ponca, Neb., a mixed train broke in two and the rear portion afterward ran into the forward one, ditching 1 passenger car and 4 freight cars. The wreck took fire, and one passenger car and one freight car were burned up. One passenger was injured.

And 17 others on 16 roads, involving 5 passenger and 19 freight and other trains.

BUTTING.

4th, on New York, New Haven & Hartford, at South Boston, Mass., a southbound passenger train collided with an empty passenger train backing northward, wrecking one passenger car. Two employees were injured.

6th, 5 a. m., on Illinois Central, near Tolono, Ill., butting collision of freighttrains, both of which were running at full speed; both engines and 8 cars wrecked. There was a dense fog at the time.

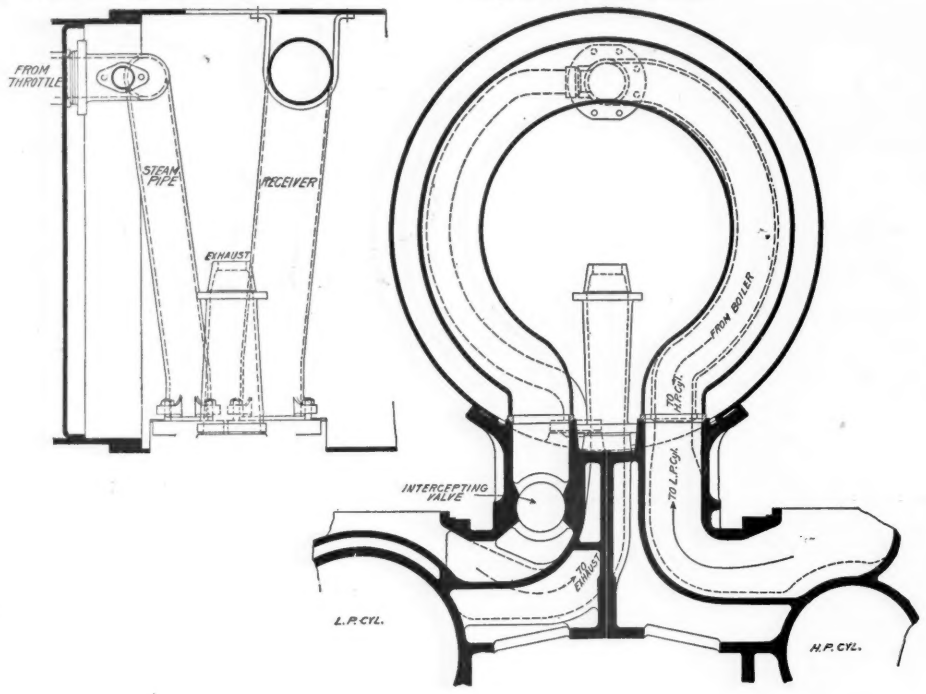


Fig. 1.—Intercepting Valve for Compound Engines—Schenectady Locomotive Works.

6th, 5 a. m., on Elgin, Joliet & Eastern, near Naperville, Ill., a freight train, approaching a meeting place, ran past the switch and collided with an opposing freight train, wrecking the engines and several cars. A brakeman was killed and one engineman and one fireman injured There was a dense fog at the time.

7th, 4 a. m., on Southern Pacific, at Nord, Cal., butting collision of passenger rains, ditching several cars, one of which, containing 7 prisoners chained together, fell into a pool of water. Several passengers were injured. It is said that the northbound train approached the station at uncontrollable speed and ran past the switch.

7th, 5 a. m., on Louisville & Nashville, at McGhee's, Ala., butting collision of freight trains; one engineman and one brakeman killed and one fireman badly injured. It is said that a telegraph operator failed to stop the southbound train.

13th, on New Jersey & New York, at Nyack, N. Y., collision between a passenger train and an empty engine, damaging both engines. One conductor and one fireman were injured.

27th, 4 p. m., on Chicago & Alton, near Little Blue River, Mo., butting collision of freight trains, wrecking both engines. One fireman was injured.

CROSSING AND MISCELLANEOUS.

3d, 4 a. m., on Baltimore & Ohio, near Branchville, Md., a freight train broke in two, 5 cars being stopped at Muirkirk. The forward part of the train ran on some distance, when several other cars broke away from it and stopped. The engineman then went forward to a side track, and leaving what cars he had, started back for the cars at Muirkirk, not knowing that a second break had occurred. The engine collided with the cars that had stopped midway, and the tender and one car were badly wrecked. The engineman, fireman and one brakeman were injured. A blinding snow was falling at the time.

10th, 11 p. m., on Butte, Anaconda & Pacific, at Anaconda, Mont., 2 freight cars escaped control on a descending grade and collided with a switching freight train. A brakeman and an engineman were injured.

22d, on Pennsylvania Road, near Ebensburg, Pa., a passenger train ran into a freight car which had been carelessly left standing on the main track, and several passengers were injured.

And 11 others on 9 roads, involving 3 passenger and 16 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

1st, 2 a. m., on Great Northern, at Malaga, Wash., a passenger train was derailed by spreading of rails and one coach was overturned. The fireman and one passenger were badly injured and 8 other passengers slightly. The overturned car caught fire, but the passengers, 21 adults and 11 infants, were, by great exertion, got out before the flames harmed them.

6th, 11 p. m., on Cumberland & Pennsylvania at Franklin Mine, Md., a passenger train broke through a trestle which had been weakened by floating ice and two cars fell through into a creek. The cars were partly submerged, but the 15 passengers succeeded in getting out. The engineman and firemen were injured, the former fatally.

17th, on Louisville & Nashville, near Montgomery, Ala., a freight train was derailed by a broken rail and 15 cars were wrecked. A tramp was killed.

25th, on Fitchburg road, near Shelburne Falls, Mass., a passenger train was derailed by a broken rail, and 2 passenger cars fell into the ditch. Six passengers were injured.

And 7 others on 7 roads, involving 7 freight trains.

DEFECTS OF EQUIPMENT.

2d, on Atchison, Topeka & Santa Fe, near Mulvane, Kan., a heavily loaded car in a freight train broke down and derailed several others, making a bad wreck. A brakeman was badly injured.

8th, on Whippany River Railroad, near Morristown, N. J., a locomotive was derailed by the breaking of an axle and fell down a bank; engineman and fireman slightly injured. It is said that the wrecked engine, which was 40 years old, was the only one owned by the company.

12th, on West Virginia Central & Pittsburgh, at Barnum, W. Va., a passenger train was derailed by the train was derailed by a misplaced switch and the engine was overturned. The fireman was killed and the engineman fatally injured. A sleeping-car porter was also hurt.

22d, on Atchison, Topeka & Santa Fe, near Summerville, Tex., a freight train broke through a trestle bridge which was undergoing repairs, and the engine and 4 coal cars were wrecked. The engineman and fireman were injured. It is said that the train was properly flagged by the repairman.

And 4 others on 4 roads, involving 1 passenger train and 3 freight trains.

UNFORESEEN OBSTRUCTIONS.

2d, on Southern Pacific, near Madera, Cal., a passenger train was derailed at a washout and 2 passenger cars were wrecked. Seven passengers were injured.

6th, on Fall Brook Railway, at Woodhouse, Pa., a passenger train was derailed at a point where one of the rails had been knocked out of line by a tree which fell from the mountain side about 1,200 ft. above the track. The cars fell down a bank and lodged on the ice of Pine Creek. The fireman jumped off and was fatally injured. There were only five passengers on the train; one of these and the conductor were injured. The tree fell only a moment before the train reached the spot. This is the first accident on the Fall Brook road where all the cars of a passenger train were derailed. No passenger has yet been killed on the road.

21st, on Norfolk & Western, near Lavalletts, W. Va., a passenger train was derailed at a washout and the engine and 3 cars were wrecked. The baggageman, fireman and engineman were injured, the two former fatally.

23d, on Chesapeake & Ohio, at Glen, Ky., passenger train No. 1 was derailed at a washout, and the engine and first 2 cars were ditched. The Roadmaster, riding on the engine, was killed and 6 trainmen and 4 passengers were injured.

And 5 others on 5 roads, involving 2 passenger and 3 freight and other trains.

UNEXPLAINED.

5th, on Atchison, Topeka & Santa Fe, in Chicago, Ill., a sleeping-car in a passenger train was derailed at a switch and 2 passengers were injured.

6th, on Baltimore & Ohio, at Davisville, W. Va., a freight train was derailed and the engineman and fireman were killed.

16th, on Great Northern, at Woodville, Mont., a freight train was derailed and the engine and 12 cars were ditched. Two trainmen were injured.

24th, on St. Louis & San Francisco, near Tyson, Mo., a passenger train was derailed and several cars were ditched.

26th, on Nashville, Chattanooga & St. Louis, at Cowan, Tenn., several cars of a freight train were derailed and fell down a bank. A brakeman was injured.

27th, 7 p. m., on Chicago & Alton, near Marshall, Mo., a freight train running at high speed was derailed on a curve and the engine and 8 cars were ditched. The engineman and one brakeman were fatally injured.

28th, on Baltimore & Ohio, at Zedikers, Pa., the engine of a freight train was derailed and 20 cars were wrecked. The engineman and fireman were killed.

And 19 others on 17 roads, involving 3 passenger and 16 freight and other trains.

OTHER ACCIDENTS.

6th, on Minneapolis, St. Paul and Sault Ste. Marie, near Hunt Spur, Mich., the dining-car of a passenger train took fire and was quickly burned up. The adjoining cars, both in front and behind, were saved with difficulty.

22d, 4 a. m., on Alabama Midland, near Troy, Ala., the front driving axle of an empty engine was broken and one wheel fell into the ditch. The engineman was injured by the broken parallel rod.

A summary will be found in another column.

The Schenectady Intercepting and Exhaust Valves.

The engravings show the Schenectady Locomotive Works' intercepting and separate exhaust valves for compound locomotives as designed by Mr. Pitkin and Mr. Sague for the Northern Pacific 12-wheeler described by us Feb. 26.

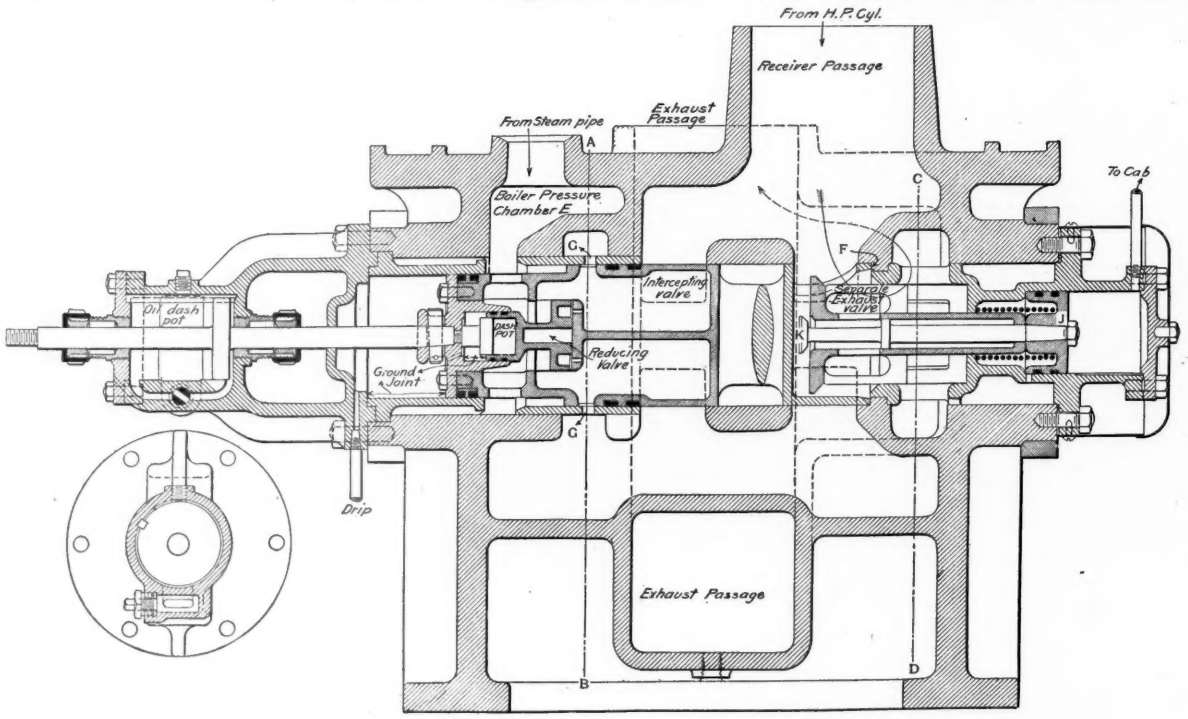


Fig. 2.—Position of Valves when Engine is Running Simple.

Fig. 1 gives sections through the smoke arch and cylinder saddles, and shows the steam passages, the receiver, and the location of the intercepting valve in the low-pressure cylinder saddle.

Fig. 2 is a vertical section through the low-pressure-cylinder saddle and intercepting valve, and shows the intercepting and separate exhaust valves in the position taken when engine is working simple.

Fig. 3 shows the same section through the low-pressure

cylinder as in Fig. 2, and shows the intercepting and separate exhaust valves in the position assumed when engine is working compound.

Fig. 4 shows two transverse sections through the low-pressure cylinder saddle *AB* and *CD*, for location of which see Fig. 3. Section *A B* shows the passages for admitting live steam into the low pressure cylinder, and section *CD* shows the outlet passage from the separate exhaust valve to the main exhaust pipe.

With the arrangement of valves shown in these figures, the engine can be started and run either compound or simple, and can be changed from compound to simple or from simple to compound at the will of the engineer, with any position of throttle, and at any point of cut-off. The part which each valve does in accomplishing this is as follows:

The separate exhaust valve when open allows the steam to exhaust direct from the high-pressure cylinder to the atmosphere without going through the low-pressure cylinder, thus working the engine simple, and when closed causes the steam from the high-pressure cylinder to go through the low-pressure cylinder, thus working the engine compound. The intercepting valve closes the passage between the cylinders when the separate exhaust valve is open, so that steam cannot go from the high-pressure cylinder to the low-pressure cylinder, and it admits steam to the low-pressure cylinder direct from the dry pipe through the reducing valve. When the separate exhaust valve closes, the intercepting valve opens the passage between the cylinders and cuts off the supply of steam from the dry pipe to the low-pressure cylinder.

The reducing valve works only when the engine is running simple, and throttles the steam passing through it, so that the pressure of steam going to the low-pressure cylinder is about one half the steam pressure in the dry pipe.

The intercepting and reducing valves are worked automatically by the steam pressures acting on the difference of areas of the ends of the valves, and their movement is cushioned by dash pots. The separate exhaust valve is operated by the engineer, by means of a three-way cock in the cab. To open the separate exhaust valve, the handle of the three-way cock is thrown so as to admit air or steam pressure against the piston *J*. Pulling the handle back relieves the pressure against *J* and the spring, which is shown in the figures, shuts the valve.

All the engineer ever has to do in connection with the operation of the valves is to pull the handle of a three-way cock in the cab, one way or the other, according as he wishes the engine to run simple or compound. The engineer uses this handle under the following conditions:

First, to start simple. Under ordinary conditions this is not necessary, but if the maximum tractive power of the engine is needed to start a heavy train, the engineer pulls the handle of the three-way cock so as to admit pressure on the piston *J*, Fig. 3. This will force the piston *J* into the position shown in Fig. 2, which opens the separate exhaust valve and holds it open. As soon as the throttle is opened steam at boiler pressure enters the chamber *E* and forces the intercepting valve against the seat *F*, as shown in Fig. 2. Steam enters the high-pressure cylinder and is exhausted through the receiver pipe and separate exhaust valve to the atmosphere, as shown in Figs. 1 and 2. Steam also enters the low-pressure cylinder from chamber *E* through the reducing valve and ports *G*, shown in Figs. 2 and 4, and is exhausted in the usual way. The steam is prevented from reaching the low-pressure cylinder at boiler pressure by going through the reducing valve. As will be seen from Fig. 2, the valve is partly balanced by the cylinder open to the atmosphere, and the boiler pressure acting on the unbalanced area throws the valve to the right. When the pressure on the right of the valve becomes high enough it will throw the valve to the left, because it acts on the whole area of the valve, and, in so doing, throttles the steam to the proper pressure for the low-pressure cylinder.

Having started the train in this way, when the engineer wishes to change the engine from running simple to running compound, he pushes the handle of the three-way cock to its first position, which relieves the pressure on the right of the piston *J*, and the spring throws that piston to the right, into the position shown in Fig. 3, closing the separate exhaust valve. As soon as this valve is closed the pressure in the receiver rises and presses the intercepting valve to the left against the pressure in chamber *E*, which only acts as an unbalanced area of the valve. The receiver pressure holds the intercepting valve to the left, as shown in Fig. 3, closing the ports *G* and openinga free passage from the high pressure cylinder to the low pressure cylinder, and the engine works compound.

It will be noticed that, while working compound, which is the usual way of working the engine, the intercepting and reducing valves are both held against ground joint seats which prevent the leakage of steam that may have leaked past the packing rings.

Now with the engine running compound, if the engineer wishes to run the engine simple, because of a heavy grade, he pulls the handle of the three-way cock the same as for starting simple. This will open first the by-pass valve *K*, and then the separate exhaust valve, the by-pass valve relieving the pressure more gradually than if the large valve was opened at once. As soon as the separate exhaust valve is open the pressure in the receiver drops and the intercepting valve is forced against the seat *F*, by the pressure in chamber *E*, and the engine runs simple as before. When grade is passed, the engineer pushes the handle of the three-way cock over and the engine begins to work compound. To start the engine compound the separate exhaust valve is left closed, as in Fig. 3, and when the throttle is opened the intercepting valve will be forced against the sest *F*, by the pressure in chamber *E*, as shown in Fig 2. The low-pressure cylinder will then take steam through the ports *G*, and the high-pressure cylinder will exhaust into the receiver for a few strokes of the engine. This will raise the pressure in the receiver and force the intercepting valve into the position shown in Fig. 3, closing the ports *G*, and the engine will run compound.

The combination of the automatic intercepting valve with the separate exhaust valve permits the engine to be changed from simple to compound, and the reverse, very smoothly and without danger of jerking the train, and in recent tests the engine was changed from compound to simple and the reverse repeatedly, when operating at a maximum power, with the throttle remaining wide open.

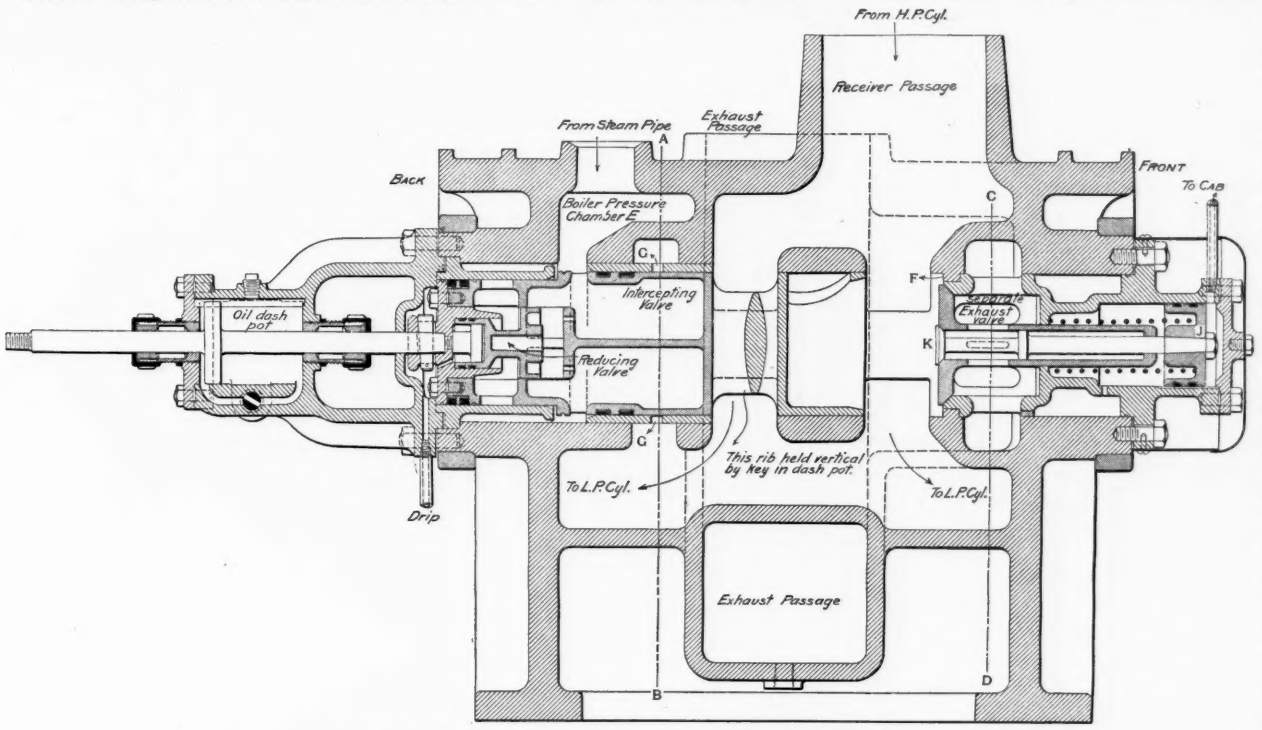
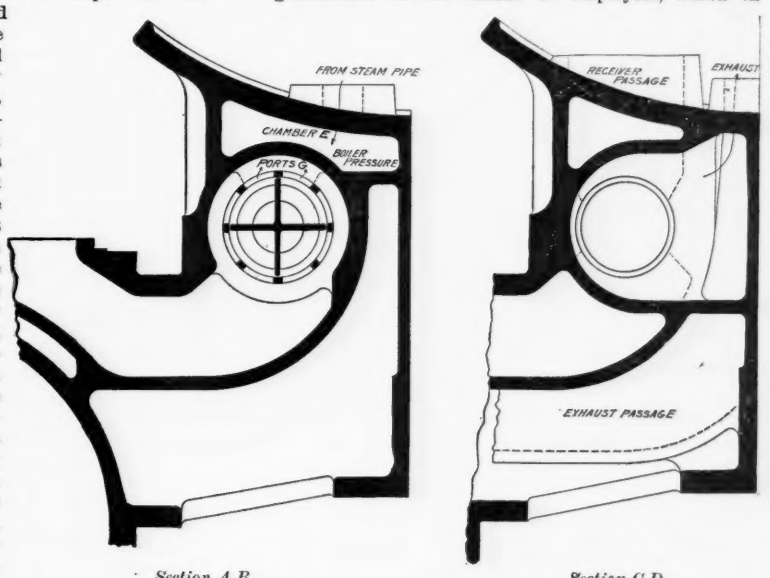


Fig. 3.—Position of Valves when Engine is Running Compound.



Section A B. *Section C D.*

Fig. 4.—Intercepting Valve.

Hard Railroading.

The Russian Trans-Caspian Railroad affords an example of railroading under difficulties calculated to discourage the most persistent and ingenious manager. At the time of its construction much was said of lack of water on the line. Since, many experiments have been made with artesian wells, generally without success. Along more than 60 miles of the road the drill penetrates a stratum of stiff clay which apparently has no bottom. In 1887, after going down 600 ft., such a well was abandoned; in 1893 it was taken up again, and in the course of three years a depth of 1,575 ft. was reached, all the way through clay, without finding water, though the bottom was 845 ft. below the level of the Caspian Sea.

If some of this clay was on the surface it would be a great improvement on the sand, which blows over the track like snow, and is very much harder to clear off. While the storm is blowing nothing can be seen more than 100 ft. distant, and in 1893 a storm covered the track more than 6 ft. deep for a distance of 16 miles, and a new track was laid the whole distance.

Finally, an earthquake in 1895 not only prostrated many of the buildings on the line, but bent the rails and displaced them both in line and surface. About 450 miles of the road, from the Caspian eastward, passes through desert before fertile land is reached, in which about an equal length ha been constructed. Then the harbor at the Caspian end silted up, and only last October a new line to the harbor of Krasnovodsk was opened, and the old harbor and the track to it were abandoned.

Railroad Sanitation.

In September, 1895, a conference was held in Amsterdam of persons interested in the subject of the sanitary arrangements of railroads and other means of transportation. The importance and extent of the questions which arose then resulted in a decision to hold a second conference this year at Brussels, which will take place next September. The subscription is five francs, in consideration of which the subscribers will receive a copy of the proceedings of the conference. Those who wish to join this conference should address the Secretary, Dr. J. De Lantsheere, Rue de l'Association, No. 56, Brussels. The honorary President of the Committee of Organization is the Minister of Agriculture and Public Works. The President is Dr. Nuel, Professor in the University of Liege. The members of the committee include officers of railroads and the marine and members of the medical faculties. The main divisions of subjects to be considered at the Brussels conference are: Organization of Medical service, control of the physical condition of the working staff, and measures of hygiene to secure the health of the staff and of passengers. Under the first heading the questions to be especially considered are whether or not the medical service should be a specific division of the administration, or whether it should be a part of the organizations for the benefit of employees, which in Europe are very general. Under the second division will be considered methods of physical examination of employees as to general health and qualifications, and as to special defects of sight and hearing. Under the third will be considered the means of preventing the spread of disease, the question of the use of intoxicating drinks among members of the staff, results of measures taken in the last 10 years to improve the sanitary condition of methods of transportation and finally organization of the service for aid in case of accidents.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The United States Circuit of Appeals at New York, Judges Wallace and Lacombe, on March 19 affirmed the opinion of Judge Wheeler, reported in the *Railroad Gazette* of June 5, 1896, dismissing the complaint of the government against the Joint Traffic Association The arguments were substantially the same as those presented before the lower court, and the judges delivered their decision without rising from their seats. The case will at once be appealed to the Supreme Court of the United States. That court, as appears from other news in this paper, has just delivered an opinion, in another case, which has already practically reversed one of the main points in the Joint Traffic case. While this latest Washington decision seems to endanger the life of all traffic associations, and thus to threaten tremendous financial loss to all the railroads of the country, it is not at all certain that it will reverse the decision against the government in its suit against the Joint Traffic Association. The opinions of Judges Wheeler, Wallace and Lacombe in that case are based on several other points, including technicalities about injunctions and about differences between statute law and common law, injunctions and other remedies, and so on. But, of course, Mr. Morrison, or any one of a dozen other "friends of the people" who believe that unrestrained competition is the normal condition in which railroads should live, may at any time begin a new suit against the association, avoiding the blunders of the first one, if such a course seems likely to prove popular.

The Supreme Court of the United States has decided that the Anti-trust law of July 2, 1890, applies to railroads, thus demolishing one of the principal arguments supporting the defense (thus far successful), which the Joint Traffic Association has made in the suit now pending against it and perhaps shaking the foundations of all traffic associations. The present decision is in the case of the government against the Trans-Missouri Freight Association, which was begun over five years ago. The decisions of the lower courts upon it were reported in the *Railroad Gazette* of Dec. 2 and Dec. 9, 1892, and Oct. 20, 1893. Judge Riner, in the District Court at Topeka, Kan., held that the Sherman Anti-trust law did not apply, because the regulation of railroads had been fully dealt with previously in the Interstate Commerce law; and that even if it did apply, the railroads, in forming the association, aimed only at justice and equity and therefore had done nothing to harmfully affect trade. In short, he sustained the doctrine that healthy competition should be fostered and only excessive competition repressed This decision was subsequently sustained by the Circuit Court of Appeals, but both these courts are now overruled by the Supreme Court, the decision of which is briefly reported in another column. The opinion of the Supreme Court only prevailed, however, by the narrow margin of five to four. In the absence of the full text of the decision, discussion of its bearing on the different features of traffic associations must be postponed. So far as can be judged from what the telegraphic report tells us, an agreement which *may* have the effect of raising freight rates, or of maintaining them when otherwise they would fall, is just as severely condemned by the law as an agreement which actually does have such effect. This overrules the opinions of many wise judges, delivered in a great variety of cases, and we may be sure that the dissenting opinion will give us some entertaining criticisms of the majority decision. On the question of the application of the Sherman law to railroads the same as to other corporations or persons, the decision of the Supreme Court seems to us very strong. We said as much in our comment on the case in 1892 and 1893. The strength of Judge Riner's opinion lay in his common sense interpretation of what is meant by "restraint of trade." Mr. Carter, in his argument in the Joint Traffic Association suit, claimed that railroads were not amenable to the Sherman law because Congress had definitely rejected a proposition to specifically mention them in the law; but the absence of any mention of railroads cannot detract from the strength of the simple and all-inclusive language of that law, and the Supreme Court evidently means to hold Congress to its precise words. This claim was not Mr. Carter's chief argument on the point; he also asserted that the Sherman law was too ambiguous and indefinite to amount to much. What Justice Peckham thinks on this point we shall probably see when his full decision comes out.

We observe a certain anxiety on the part of some of our contemporaries across the Atlantic lest the American rail makers shall invade the British market, which event does not seem to us so disastrous as it does to our contemporaries. One of them says that the *Railroad Gazette* has shown derailments from broken rails for the last ten years to average 48 a year and "will not be surprised if European railway engineers think twice before they admit American rails on their respective lines in any great quantity." Certainly they should think twice and should be very careful in specifications and inspection. This is for the ultimate good of all parties concerned. We suggest, however, that the figures of derailments from broken rails which are quoted have not the slightest bearing on the subject of relative safety of American and English rails, for several reasons. First, British railroads also have broken rails, as, for instance, the serious St. Neots accident. We shall not spend any time in hunting through the Board of Trade reports to ascertain how many broken-rail accidents have occurred in the United Kingdom. Second, our reports say nothing about the age of the broken rails, which is, for several reasons, a very important matter quite apart from the original quality of the rail. Third, our reports do not show how many of the rails which broke were English rails, of which a good many are still in service in the United States. We have within a week walked over a line in which we saw English rails more than 20 years old. Fourth, we should not be surprised to know that with a given train mileage, or with a given line mileage, more rails were broken in the United States than in Great Britain, for the reason that our average wheel loads are much higher and our average rails are much lighter. We venture to say that as good rails are made to-day in the United States as anywhere in the world; indeed we are disposed to think that the recent high-carbon rails, made of selected ore, under careful specifications, with inspection all the way through the mill, are better than any rails that are turned out commercially in any other country. We do not pretend for a moment that these represent the average of American rail practice, but they show what our mills can do if they are paid for good material and good work. This of course is only a general statement, but if our contemporary is disposed to debate the matter we shall be glad to furnish specific facts.

Export Grain Rates.

The grain rate investigation in New York last week brought out little that was new, and the testimony in favor of maintaining the differentials is yet to be heard. The railroad men appear not to have been summoned, Mr. Blanchard, Commissioner of the Joint Traffic Association, and Mr. Mills Traffic Manager of the Boston & Albany, being the only ones that testified. The former simply made a general statement and answered a few unimportant questions. Mr. Mills stated that his road had no contracts with ocean steamers. The principal value of the hearing was in bringing together the testimony of the merchants in regard to the conduct of business at New York and other ports where grain is transferred from cars to vessels, and in regard to ocean rates. There was no cross-questioning of any consequence. We report the salient features of the hearing in another column.

It simply makes clear what every one directly interested probably knew before—that, ocean rates to Europe being now about the same from southern ports as from New York, the lower rail rates to the former make the New York route to Europe the highest-priced one of the whole list.

The New York lighterage being absorbed by the railroads, the rail rate, as published, takes the grain to the ship's side in New York, the same as it does at the other ports, and the floating elevator that takes it from the lighter charges the same for its services that is charged by the fixed elevators at the other ports; so that, as the complainants aver, the change, if any is made, must be made in the railroad rates.

If the New York railroads think it will be unprofitable for them to reduce their rates, they can claim that, with the lighterage deducted, they are accepting a very low rate already, and that their receipt per mile is lower than that of most of their competitors, which is true; but when we come to make comparisons by distance, the cost-of-service theory is being recognized, and the hollowness of all claims based on that theory was emphatically shown at the hearing. Whatever may be said about the distance basis, in connection with the arbitration of 1882 or in the claims made on behalf of the Baltimore & Ohio since that time, the merchants must have seen very clearly, from the statements made by Mr. Kernan, that it is wholly ignored in calculating rates. Whenever two or more railroads settle rates on competitive business, either by themselves compromising or by hiring three outsiders to do the compromising for them, they consider the conditions, not the theories If A claims shorter distance as a reason for being allowed to make a lower rate, B accepts the claim just as far as he thinks A can use it as an argument in getting business. No matter if the claim is wholly fallacious, if A can use it to get business, B considers it in deciding how much he will agree to surrender. For instance, in 1882, the New York roads agreed to let the Baltimore roads charge three cents less than the rate to New York; but the real reason was, not that the distance to Baltimore was less, but that the cost from Baltimore across the ocean was more. It was plain that to ship grain from Baltimore it must cost less on board the ship than at New York; and the Baltimore roads would undoubtedly have made the same claim if their lines had been 50 per cent. longer. Distance would not count until actual loss and bankruptcy should have appeared imminent. Now, ocean rates from Baltimore are more nearly on a par with those from New York, and so the real ground for the differential has changed.

If the New York roads wish to increase their business in export corn they will have to either reduce their rate or get the more southerly lines to make an advance. According to the merchants they could take off from 1½ cents to 2 cents per 100 pounds by doing the New York lighterage themselves instead of paying a high rate to the company that now does it. Why they are so generous to the lighter company does not appear. The fact that the New York railroads make a prohibitive elevator charge against ocean vessels would seem to indicate that the elevators can be more profitably used in some other business. Whether it would pay to build additional elevators is a point on which no information is forthcoming. The recent report that the National Docks Company would soon build a large grain elevator south of Jersey City is denied as wholly unfounded.

It seems that the proprietors of the elevators at other ports have to employ various "devices" to get business; at Boston free storage has to be given; at Newport News the ocean vessels have to be subsidized, in one form or another; at Baltimore it is charged that similar methods play some part. It remains for the Interstate Commerce Commission to find out and show how much weight should be accorded to these various claims of irregularity in rates; but if they have any weight at all they explain, in part, the absence of any activity in the direction of adding to the export facilities at New York.

Whatever may be the result of the discussion of the above-mentioned factors, there still remain some conditions at New York that cannot be altered except as time and actual changes in the currents of business shall force changes of methods. For one thing, vessels making up part of their cargo out of other goods take grain at rates a trifle lower than tha rates paid for full ship loads. This tends to perpetuate the clumsy lighterage and floating-elevator method of transferring. As long as the import and the miscellaneous export business at New York continue heavy, this cause will operate. The canal will, undoubtedly, continue to get a share of the grain, and this will help the floating elevators to retain the business, not only while navigation is open every year, but for several weeks after. Canal boats

can go anywhere in the harbor and after the canal freezes they can wait indefinitely.

And finally, whatever may be the case as to the factors which can be definitely measured, there is little doubt that the reluctance of the New York railroads to try to get a share of the business now going to Baltimore, Norfolk and Newport News is partly, perhaps mostly, due to their more crowded lines and terminal yards and their more profitable miscellaneous business. The enlargement of the yards would be very costly, while the profit in carrying corn is very small. The difference between the New York roads and the others is somewhat like that between the dog and the fox in the fable. The New York roads are fighting for a dinner (when they are not terribly hungry for the kind of food available), but the others are fighting for their lives.

The Limits of Speed and Frequency of Trains in Tunnels.

At the last meeting of the New York Railroad Club an operating question was raised which got no answer. The problem is this? Given a double track tunnel, 2½ miles long; at one end there is a 1½ per cent. grade down, then a short bit of level, then a bit of 1½ per cent. grade up and the rest a gradual incline up. This tunnel will be worked by electric trains. It is proposed that these trains shall be dispatched at intervals of one minute; that they shall run through without stop. Indeed the trains will run 6½ miles further in open cutting or on the surface, making the whole run, without stop, of 10 miles, at a speed, from terminus to terminus, at 30 miles an hour. The train will consist of a motor car carrying passengers and as many trailers as are necessary for the service. The question is whether or not it is safe to run trains of this character at 30 miles an hour, on one minute headway, through a tunnel with such grades.

In considering this problem we must reckon on more than 30 miles an hour actual speed. Time is lost in getting up to speed and in stopping; trains may lose speed going up the 79-ft. grade. Therefore we shall assume 40 miles an hour as the train speed to be provided for. Can such a service be worked safely in such a tunnel?

Theoretically, we should say yes, undoubtedly. The trains should have the Westinghouse automatic quick-action brake with a brake on every wheel and braking power as high as can be used without skidding the wheels. The trains would never run without some load of passengers and probably a good deal of the time they would carry full loads; they certainly would during the hours when it is necessary to run them on one minute headway. Therefore, the passenger load will be all the excess of load needed over that which is braked. Trains equipped with brakes of this character, with a stiff brake rigging calculated to use all the weight of the car, can be stopped in practice, on the level, on a dry rail, in 465 feet from 40 miles an hour. This is a safe assumption for level track and rail in good average condition. The same train could be stopped from 40 miles an hour going down a 1½ per cent. grade, on a dry rail, in 520 feet. For these distances we are indebted to Mr. R. A. Parke, who says "I have given distances which I think it is safe to rely on," and we know no better authority.

But what kind of a rail may we expect?

The probable condition of the rail in a tunnel like that of which we speak is a matter of speculation. There are no exactly parallel cases to be found. The experience of the Hoosac tunnel or of the Arlberg tunnel would be instructive within certain limits, both of them being very long tunnels. Perhaps the City & South London tunnel would be even more closely parallel to the one of which we write. Concerning the conditions in these we shall endeavor to get some information. Meanwhile, we learn that the Erie tunnel at Jersey City is quite susceptible to the outside atmospheric conditions. In dull weather the rail is "greasy" while in dry weather it is good. The temperature in this tunnel also fluctuates with the variations outside. This tunnel, however, is only 4,700 ft. long and perhaps we cannot safely reason from that to a tunnel two or three miles long, lying very deep under the surface with few shafts to the outside air.

In all these tunnels except the City and South London the ground water is not excluded, and the air is charged with moisture from that. To this must be added the vapor from the locomotives which is an important amount. If, now, we add to this, warmer air from outside, loaded with vapor, there must be considerable precipitation on the rail.

The tunnel of which we speak could be "bone dry" so far as ground water goes, and would have no condensed steam. The precipitation from the outside air entering the cooler tunnel and bringing more or less water to be dropped as the temperature is reduced we shall not attempt to estimate. It is possible that the ventilation could be made so good that there would not be enough deposit of water to affect seriously the condition of the rail. Concerning all that we hope to get information from those who know more than we do.

But probably this point is less important than it seems at first. For braking purposes, as well as for traction, the difficulties arising from a "greasy" rail might be done away with by the use of an automatic sanding device; that is, by using a pneumatic sander so arranged that sand is ejected whenever the brakes are applied. Such an arrangement has been experimented with by the Westinghouse Air-Brake Company and the Pennsylvania Railroad Company with results that indicate that it would be practical and efficient. A special air reservoir and triple valve are used for working the pneumatic sander, and this triple is cut in with the air-brake system so that the movement of the engineer's valve to put on brakes causes sand to be ejected on the rail. The amount of sand used by such an arrangement would probably not be large, for it can be directed with great precision to the exact spot where it is needed, and we believe it to be a fact that pneumatic sanders are actually economical of sand.

But we shall assume that the rail will be "greasy" and add 50 per cent. to the distances given above and say that we can safely count on stopping the given train, in the worst condition of rail that will be found in the tunnel, from 40 miles an hour, in 700 ft. on the level and in 800 ft. on the down grade.

With these distances as the starting point, block signals can be arranged with a view to ample security on one hand and to minimize on the other hand the delays due to irregularities of speed. It may be that it would be found best to make the blocks as short as 1,000 ft. with a home and distant signal at each block. Then there would be two full blocks between each two trains, when trains were running regularly; and in the worst case, the motorman would get a warning 1,000 ft. back of the nearest possible train. Whether or not these signals should be automatic or manual with the lock and block, is a question of practice, and indeed this whole signaling question is one to be settled after careful study of the profile and the train movement. We need not enter into it now; but safe signaling for such conditions are well within the resources of the art.

Further than this, the tunnel should be electrically lighted throughout. This should be done not only as a means of security in case of any delay or breakdown, but to give the motorman and the passengers confidence.

We have considered the case theoretically. Now what is done in practice? We know of nothing like this in the world. We know of no tunnel in which numerous trains are worked at such speed and on a headway so short. A case somewhat analogous to that which we are condersing is that of the Fourth avenue tunnel of the New York Central. Here several successive trains often follow each other on one line of rails, at intervals of less than one minute, and must make more than 30 miles an hour. These are not only the regular scheduled passenger trains, but the empties going out to Mott Haven. The blocks here are of different lengths One of them is probably about half a mile and others something less than three-quarters.

February Accidents.

Our record of train accidents in February given in this number includes 44 collisions, 71 derailments and 2 other accidents, a total of 117 accidents, in which 24 persons were killed and 81 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted except where the circumstances of the accident, as reported, make it of special interest.

These accidents are classified as follows:

COLLISIONS.	Rear	Butting.	Crossing and other.	Total.
Trains breaking in two	12	0	0	12
Misplaced switch	1	0	0	1
Failure to give or observe signal	1	0	1	2
Mistake in giving or understanding orders	2	1	0	3
Miscellaneous	2	4	4	10
Unexplained	5	2	9	16
Total	23	7	14	44

DERAILMENTS.

Broken rail	4	Misplaced switch	3
Loose or spread rail	1	Track repairers	1
Defective bridge	3	Derailing switch	1
Defective switch	1	Failure to observe signal	1
Defective frog	1	Animals on track	2
Bad track	1	Landslide	3
Broken wheel	6	Washout	3
Broken axle	10	Accidental obstruction	1
Broken truck	1	Unexplained	26
Fallen brakebeam	1		
Broken car	1		71

OTHER ACCIDENTS.

Cars burned while running	1
Breakage of rolling stock	1
	2
Total number of accidents	117

A general classification shows:

	Collisions.	Derailments.	Other accid's.	Total.	P. c.
Defects of road	0	11	0	11	9
Defects of equipment	12	19	1	32	28
Negligence in operating	16	6	1	23	19
Unforeseen obstructions	0	9	0	9	8
Unexplained	16	26	0	42	36
Total	44	71	2	117	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other accid's.	Total.
Passenger	17	20	1	38
Freight and other	53	52	1	106
Total	70	72	2	144

The casualties may be divided as follows:

	Collisions.	Derailments.	Other accid's.	Total.
Killed:				
Employees	5	16	0	21
Passengers	2	0	0	2
Others	0	1	0	1
Total	7	17	0	24
Injured:				
Employees	17	22	1	40
Passengers	9	32	0	41
Others	0	0	0	0
Total	26	54	1	81

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	0	7	1	2
Defects of equipment	0	11	3	6
Negligence in operating	2	9	7	21
Unforeseen obstructions and maliciousness	0	12	4	8
Unexplained	0	2	6	3
Total	2	41	21	40

Fourteen accidents caused the death of one or more persons each, and 22 caused injury but not death, leaving 81 (69 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with February of the previous five years shows:

	1897.	1896.	1895.	1894.	1893.	1892.
Collisions	44	34	45	37	84	85
Derailments	71	91	99	65	117	115
Other accidents	2	4	8	3	13	12
Total accidents	117	129	143	105	214	212
Employees killed	21	35	13	14	45	37
Others killed	3	2	5	1	14	7
Employees injured	40	54	75	45	127	55
Others injured	41	53	44	13	176	28
Passenger trains involved	38	51	72	38	83	79
Average per day:						
Accidents	4.17	4.45	5.11	3.75	7.64	7.31
Killed	0.86	1.28	0.64	0.54	2.11	1.52
Injured	2.89	3.69	4.25	2.07	10.82	3.55
Average per accident:						
Killed	0.20	0.29	0.12	0.14	0.27	0.20
Injured	0.69	0.83	0.83	0.55	1.41	0.48

The number of fatalities reported is again small, and the number of passenger trains involved in very bad accidents in February was unusually small. The bridge accident at Franklin Mine, W. Va., on the 6th, had all the elements of disaster, and there were 15 passengers in the wrecked car, but the outcome was very fortunate. There were two passenger train disasters in which fire played a considerable part, those at Malaga, Wash., and at Ponca, Neb.

The number of street railroad accidents noted in February was 11, five persons being reported killed and 20 injured. The most notable of these was that at Chicago, on the 25th, where an electric car was caught between two opposing passenger trains on a double-track railroad. A less serious accident of this kind, at Geneva, N. Y., resulted in the death of one person, and one was killed in a butting collision of electric cars at Pittsburgh. None of the others were attended by fatal results, though in two cases cars fell down high banks. There was the usual proportion of runaways, and in one case a collision was reported as due to a defective brake on a street car. At Chicago, on the 28th, a street car ran off the end of the track where a drawbridge was open, but by great good fortune it hung on the edge of the abutment and the few passengers inside the car succeeded in getting out before it fell. A horse and wagon were, however, knocked off into the river many feet below.

Annual Reports.

Terminal Railroad Association of St. Louis.—The seventh annual report of this company, operating the St. Louis Union Station and the bridges across the Mississippi with the connecting railroad lines, has been issued. It is for the year ending Dec. 31, 1896. The report of President Julius S. Walsh shows:

	1896.	1895.	Inc or Dec.	
Gross earn	$1,793,207	$1,757,781	I.	$41,426
Oper. expen	750,768	715,024	I.	35,744
Net earn	1,048,440	1,042,757	I.	5,682
Other income	330 213	333,313	D.	3,100
Net income	1,378,653	1,376,070	I.	2,583
Fixed charges	1,368,756	1,370,398	D.	1,642
Surplus for year	9,897	5,673	I.	4,225

The increase in operating expenses is accounted for by the unusual expenses incident to the tornado in May, which were $76,647. But for this there would have been a decrease of nearly $41,000. About $120,000 has been spent during the year on construction, including a new electric light plant, and $180,000 has been advanced to meet interest on bonds of the St. Louis Merchants' Bridge & Terminal Railroad, controlled by this company. The sum of $40,211 has been expended on new

yards, coal chutes, etc. It is estimated that extraordinary expenditures will have to be made during the coming year to the amount of $222,500, of which $80,000 will go for reconstruction of the third section of the east approach to the Eads bridge.

The report of General Manager E. P. Bryan shows:

	1896.	1895.	Inc. or dec.	
Freight moved, tons	3,418 848	3,227,181	I.	191,667
Average per loaded car	15.61	15.45		.....
Freight earnings	$986,291	$927,309	I.	$58,983
Average revenue per car	$1.50	$4.45		.....
Av. revenue per 100 lbs. (cts.)	1.44	1.44		.....
Empty cars moved	140,387	129,480		.....
Passengers carried	1,478,152	1,374,585	I.	103,567
Average passengers per car	11.1	10.7		.....
Passenger earnings	$309,835	$306,021	I.	$3,814
Average per passenger (cts.)	20.96	22 26		.....
Free passengers	182,500	182,940		.....

The earnings from traffic on the upper (wagon) roadway of the bridge decreased about $30,000 in consequence of the interruption of business due to the tornado. The grain movement for the year has been disappointing, a large portion of "what should go through St. Louis" having been diverted to other channels.

The revenue per capita from foot passengers crossing the bridge was 3.97 cents as compared with 4.59 the preceding year. The revenue from each passenger crossing in an electric street car was 2.74 cents; the preceding year it was 2.59.

The business done at the Union passenger station is shown in the following table:

	1896.	1895.	Inc. or Dec.	
Gross rental	$326,567	$325,000	I.	$1,567
Less revenue from privileges	92,940	102,976	D.	10,035
Net rental	$233,627	$222,023	I.	$11,603
Expenses	286,981	292,248	D.	5,267
Chargeable to all lines	$520,608	$514,272	I.	$6,336
Cars handled, first-class	277,485	267,910	I.	9,575
Cars handled, second-class	68,928	100,678	D.	31,750
Cars handled, total	346,413	368,588	D.	22 175
Equalized cars.*	300.458	301,467	D.	1,009
Expense per car (equalized)	$0.9551	$0.9694	D.	$0.0143
Rental per car "	.7776	.7364	I.	$.0412
Expense and rental per car (equalized)	$1.7327	$1.7058	I.	$0.0269
Expense and rental per car handled	1.5028	1.3952	I.	.1076
No. of local tickets sold	493,731	546,607	D.	52,876
" coupon " "	44,166	46,717	D.	2,551
Cash received from ticket sales	$1,550,231	$1,457,367	I.	$92,863
No. of pieces of baggage handled.	851,546	858,105	D.	6,559
Daily average	2,333	2,351	D.	18
Excess baggage collections	$60,871	$61,040	D.	168

*Three second-class cars are treated as one first-class car.

During the three months when travel between England and the Continent is the most active, July, August and September, 253,196 passengers crossed the channel in 1896 by the four principal routes—Dover-Calais, Dover-Ostend, Folkestone-Boulogne and Newhaven-Dieppe. The number in 1895 was 254,465, when it was the largest on record, except during the World's Fair of 1889. Since that year the channel travel for these three months has been in successive years:

1890.	1891.	1892.	1893.	1894.	1895.	1896.
223,604	227,631	211,740	197,115	237,813	254,465	253,196

In 1888 the number was but 205,945, but this was doubtless made small because many English travelers then postponed their continental journey till the World's Fair year. Since 1890 the increase has been 13 per cent. The notable decrease in 1893, doubtless, is to be ascribed to the financial troubles of that year, but the recovery was very rapid. The different routes have not progressed alike. The number going by Calais is still a third greater than by any other route, but it was less last year than in 1888, 1890 or 1891, while since 1890 there has been an increase of 28 per cent. via Boulogne, and of no less than 50 per cent. via Ostend, which, it must be remembered, is not a route to France. The numbers of the different routes in 1896 were: Calais, 85,904; Ostend, 63,759; Boulogne, 53,451; Dieppe, 50,082. The latter, having much the longest sea passage, has a large "differential" in its favor, making it much cheaper than the direct routes to Paris.

The various traffic associations are again considering the question of the advisability of abolishing the so-called homeseekers' excursions, on the ground that the volume of travel on these excursions is not sufficient to warrant their continuance. The real difficulty is, however, that the scalpers always take advantage of these periodical excursions to manipulate rates. A sentiment has been gradually growing that these excursions should be discontinued, and in Western territory last year the motion to continue them prevailed by a very small majority, and that because one or two of the lines were known to favor them to such an extent that they would probably run them regardless of association action. Last year was probably as good a time as any to try the experiment of dropping them, owing to the small percentage of "homeseekers," but financial and business conditions have not yet improved to such an extent that there can be any considerable number of people seeking new homes in the West, and a continuance of the practice will indicate that the railroads are not so much exercised by a desire to benefit the "homeseeker" as to secure a little advertising. Of course, each G. P. A. aims to convey to the prospective passenger the idea that the only homes worth seeking are those on his particular road.

An Albany press despatch reports that Senator Lamy has introduced in the legislature a bill providing that no officer of a railroad corporation shall require or permit an employee to wear upon his hat or cap the badge or initial letters of any corporation other than the one employing him. What great danger impends, requiring a law of this kind, we are unable to guess, but we presume the proposition is harmless. We are, however, reminded of Chandler's idea, exploited in New Hampshire a few years ago, and we move to amend the bill by adding a clause that no member of the New York legislature shall wear the collar of any government except the constitutional government of the state of New York. As some of the members are said to be somewhat ashamed of the collar that they (and nearly all the Republican members) are now wearing, we should hope for a considera ble vote in favor of our amendment.

NEW PUBLICATIONS.

The Commercial Year Book. A Statistical Annual Relating to Commerce, Industries, Banking, Currency, etc , etc., of the United States and Foreign Countries. Edited by Walter A. Dodsworth, Ph. D. New York: The *Journal of Commerce and Commercial Bulletin*, 17 and 19 Beaver St., 1897; 8vo, 610 pages. Price, $1.50.

Last year the *Journal of Commerce* issued volume I. of the Commercial Year Book. The volume for 1897 has just appeared. It has been increased in size by about 100 pages, a more systematic arrangement of contents has been made and the index has been expanded to 24 pages and is now very comprehensive. It would be quite impossible to tell in any detail what the volume contains, but it is a great body of useful statistics, excellently arranged.

To begin, for instanee, with Great Britain, we have area and population, classification by employment; revenue and expenditure, the national debt for a period of 148 years, statistics of agricultural production and of raw material; imports, exports and prices of cotton, etc.; imports and exports in general and as between the United States and Great Britain, imports and exports of gold and silver coin and buillion, shipping and navigation, railroad mileage and traffic, canals and other waterways, the business of the post offices and telegraphs and description of the currency, and statistics of the banks.

The other nations of the earth are dealt with in a similar way, but, naturally, the United States is treated with far greater fullness, and in this division we have a volume of statistics filling 80 pages, besides a great many statistics classified under special heads. For instance, the lake and canal navigation is treated at great length, giving not only tonnage moved, but for the canals, lengths and dimensions of canals, expenditures on them, dates of opening and closing, etc. Six pages of special statistics of the railroads of the United States are given. There is a chapter on coinage of gold and silver, prices of silver and weekly imports of gold and silver, giving statistics for many years, and in this division very complete information is given, as well also as information of money circulation in the United States, coin and bullion in the treasury, etc., making a chapter which was of great value in last summer's campaign. Some of the other topics that may be mentioned are the iron trade of the United States and Great Britain from early dates; wealth, debt and taxation of the United States, monetary events since 1786, daily and weekly prices of staple articles in New York in 1895, shipping of the United States and the world, real estate mortgages from 1880 to 1890, etc. Finally, the publishere have this year added a condensation of the more important of the legal decisions published regularly in the *Journal of Commerce* in the department of replies and decisions.

Catalogue of the Public Documents of the Fifty-third Congress and of all Departments of the Government of the United States. March 4, 1893, to June 30, 1895. Washington: Government Printing Office, 1896.

A law passed in January, 1895, required the Superintendent of Documents to prepare and publish, at the close of each regular session of Congress, a 'comprehensive index" of public documents, beginning with the Fifty-third Congress. The volume before us is the first outcome of this law. Mr. F. A. Crandall, Superintendent of Documents, has prepared it with the purpose of beginning where the index of documents of the Fifty-first and Fifty-second Congresses left off, thus giving an unbroken continuation of the work already started. In plan the work is a dictionary catalogue; that is, it is entirely alphabetical. Authors, subjects, and, in some cases, titles have been brought together in one consecutive alphabetical list. The number of the document, the session and the volume in which it is bound are given, following the author or subject and a brief descriptive note. The volume contains 638 quarto pages and is very convenient and serviceable for those who have occasion to look up these documents. The running heads on the pages enable one to tell at a glance whether or not the reference which he seeks is on that page. In brief, the whole arrangement, and the brief and clear annotation, show the work of a trained hand, and the typography is excellent.

Progressive Questions and Answers on the Air Brake.—Mr. P. M. Kilroy, Secretary of the Association of Railroad Air Brake Men, Pine Bluff, Ark., has issued in pamphlet form the progressive form of questions and answers on the air-brake as adopted by that Association at its Boston convention last April. This is for sale at very low prices when taken in lots; single copies are 25 cents each, but lots of a thousand will be sold at 9 cents each, and considerable reductions are made for smaller lots. The questions and answers are arranged in a progressive and connected form and are full enough to give a good understanding of the subject, and the committee had in mind such a treatment as would prevent the student from memorizing the catechism to pass in examination. It is believed that these questions will be of such value to rail road companies as will warrant a very wide distribution of them.

TRADE CATALOGUES.

Vitrified Pipe vs. Brick Sewers.—The Blackmer & Post Pipe Co., St. Louis, Mo., sends us a pamphlet discussing the general question of the comparative merits of vitrified pipe and brick sewers. This is prefaced by an extract from a report from the Board of Health, London, to the effect that the general use of large brick sewers has resulted from ignorance or neglect, that such sewers are wasteful in construction and repair and costly, and that brick or stone house drains are false in principle and wasteful. House drains and sewers properly constructed of vitrified pipe do not detain and accumulate deposit.

In 1890 the Blackmer & Post Company began to make standard culvert pipe 30 in. in diameter, with shell 2¼ in. thick, and in 1895 began to make 36-in. pipe with shell 2½ in. thick as well as 27-in. pipe. They will shortly make 33-in. pipe. Besides the advantage of a smoother inside surface the vitrified pipe conduit saves a good deal in excavation, as the trench need not be so wide. The pamphlet contains letters from many city engineers, detailing at more or less length their experience with the use of pipe sewers. It also contains a report of tests made to determine the strength of large sizes of pipe against crushing. These tests were made by the George J. Fritz Foundry & Machine Co., of St. Louis. The sections of pipe were put into a testing machine, the pressure being transmitted through blocks of wood hollowed out to fit as nearly as practicable the shape of the pipe on its external circumference, and the pressure was then applied to crush the pipe as would be done by overlying material. Twenty-four-inch pipe broke at 27,610 lbs. and 28,715; 27-in. pipe broke at 33,133 lbs. and one specimen at 22,530 lbs. The range of the 30-in. pipe was from 24,297 lbs to 27,987.

Cahall Water-Tube Boilers—We have received the 1897 catalogue of the Aultman & Taylor Machinery Co., Mansfield, O., which is a book of 98 pages, bound in cloth, descriptive of the "Cahall" water-tube boilers, both vertical and horizontal. Numerous engravings show the plant of the company making the boilers and various installations, beside the details of the construction of the boilers proper. The results of numerous boiler tests are given, and engineers will find interesting and valuable information in this book.

The Link-Belt Machinery Company, Chicago, has recently issued a catalogue of 44 pages descriptive of machinery applied to the coaling of locomotives, the handling of freight in warehouses and on wharves and the storage of coal There are many half-tone engravings from photographs of plants which have been erected by this company.

K. H. Wade.

Los Angeles papers received since we last went to press give the particulars of the death of Mr. K. H. Wade, General Manager of the Southern California Railway, briefly noted in these columns last week. We condense the following from the Los Angeles *Times:*

Mr. Wade was found dead in the bath in his rooms at the Hollenbeck Hotel, Friday morning (March 12). He had been under treatment for some time in the hope of averting a pronounced tendency to apoplexy which had manifested itself, and by direction of his physicians took a hot bath each night upon retiring. He spent the afternoon prior to his death in the company of President Ripley and other officials of the Atchison, who were on a trip of inspection over the road. When he left his office he complained of fatigue, but appeared well and in good spirits. He was considered the ablest manager of transportation in the Atchison System and one of the best in the United States. He was one of the most loyal friends Southern California ever had. Under his able management the Southern California Railway has been brought to a high standard of excellence. One of his innovations on that road was the application of crude oil as locomotive fuel in the place of coal, which proved a marked economy. Aside from his railroad duties, he took a deep interest in the horticultural development of Southern California. He experimented largely in citrus and deciduous fruits upon his ranches at Highland and San Jacinto, and was the first man to demonstrate that the grape fruit could be successfully grown in California. He was a Director in the Chamber of Commerce and the Citizens' Bank, and a popular member of the Sunset and California clubs. He leaves a widow and one married daughter.

Mr. Wade was born at Wolcott, N. Y., on June 9, 1843. He first entered railroad service with the Wabash, in 1857, as a telegraph operator, afterward being promoted to train dispatcher, which position he held until 1867, when he went to the Indianapolis, Cincinnati & Lafayette. He subsequently returned to the Wabash, and in 1875 was appointed Superintendent of the Ohio & Indiana Division. In 1882 he was on the Burlington, but soon returned to the Wabash, and in 1887 was made General Superintendent of the road, which position he held until November, 1889, when he went to the Southern California.

Mr. Wade was for many years a prominent and useful member of the American Railway Association, and was

the chairman of the Train Rule Committee which made the standard code of train rules. The making of this code and the adoption of standard time are the two most important things that have been done by the association Mr. Wade was not only an able manager, but also agreeable and popular personally, and he had a very large acquaintance among railroad men.

Compressed Air in Railroad Painting.

At the last meeting of the New England Railroad Club, held in Boston Feb. 9, the subject of the economy of compressed air in painting railroad cars and structures was discussed at considerable length. Favorable opinions were expr ssed in the communications from some who have made careful comparisons of the old and new methods, and in the discussion following the presentation of the paper by Mr. C. E. Copp many facts were brought out showing that compressed air has been used successfully for this class of work. Some comparisons were made of the cost of painting the cars by a brush and by compressed air, but little was said, however, in regard to the cost of supplying air or in reference to the expense of the apparatus necessary to perform the work. Those who discussed the matter rather assumed that compressed air was available in the shops, and that the only item necessary to consider was that of the cost of applying the paint, whereas the expense of compressing the air should not be overlooked in discussing this question. Among other things, Mr. Copp said:

I saw and questioned a man who painted the equivalent of 29 standard 34-ft. coal cars in about five hours, which is an average of one every 10 minutes, and the air pres sure was poor. Various speeds of from five to ten minutes per car were realized at this work. This was for the car body and attachments only. No more material was wasted than by the brush generally. By a test made at the Pittsburgh & Lake Erie shops less was used by the spray method. But when computing the expense of painting by compressed air, the cost of the air should be reckoned in. Westinghouse air pumps will not answer for all these attachments that are being put on the shops; there must be compressors of more power employed.

As to the practicability of this method, conditions will vary. As on open-air way of painting cars in yards in pleasant weather, I have no doubt of its utility, by having the yards, of course, piped with the air, with connections at proper intervals. But in very cold weather out of doors it is found that the condensation or dampness of the air in the hose congeals and stops the valves, rendering them inoperative. To remedy this trouble, some way of warming the air by passing it through a heated coil has been considered. My opinion is that it will require as much skill, if not more, to operate a spray successfully as by the brush method, especially if the machine is at all complicated. And then it must be adjusted rightly, held at the proper distance from the work, and not too long in one place; for, if it is, it will produce unsightly runs, requiring slicking up with a brush afterward.

If lead dust from sandpapering is deadly to breathe into the system, what may lead mist be from spraying? And so of green paint containing arsenic, or any other poison. But if cars are painted with an earth paint, as they should be, such as mineral brown, which most roads are doing, then no fears need be entertained of its poisonous effects. And in this connection I should recommend, if this method of painting were adopted, to do the car all over with it, top, body, trucks, iron-work and all, and afterward black no irons, as they would be much more durable that way than with the asphaltum black which is generally applied.

To the credit of paint sprayed on, it may be truthfully said that it will go into places where, with great difficulty, if not impossibility, it is to be put with a brush.

Regarding the immediate adoption of this method of work, I should recommend its postponement, except in the line of experiment, until its patentability is cleared up, and then only when its practicability was fully settled.

The following is the estimated cost of the work done in the Pittsburgh & Lake Erie Company's freight yard during the period in which the spraying apparatus was in operation. This is compared with the time and cost of work done with the brush the laborers are paid on the piece-work plan:

	Piece work.		With spray.		Saving. Per cent.
	Hours.	Cost.	Hours.	Cost.	
Box	3½	.60	¾	.15	75
Coal	1½	.30	¼	.10	66⅔
Coke	3	.50	½	.12	76
Flat	½	.10	1/6	.05	50
Trucks, all cars	.....	.30	.....	.12	60
Roof only, box	.....	.10	.....	.04	60

Mr. H. G. McMasters, Master Car Painter of the Illinois Central Railroad, gave some comparative figures showing a saving of labor by painting with a spraying machine of 70.83 per cent. and a saving of painting material by using the spraying machine of 14.29 per cent. These figures include the placing of staging around the car, making all air connections, filling and cleaning machines, replacing the hose, or briefly the actual cost of priming one car. He stated that the cost of the second and third coat as practically the same as that of the first.

A paper prepared by Mr. John Hodge, Master Car Builder of the Atchison, Topeka & Santa Fe Railroad, was read by C. B. Gibbs. From experience, Mr. Hodge has found that for painting new work the mixture should be as follows: First coat, one gallon semi-paste mineral paint and two gallons boiled linseed oil; second coat, one gallon semi-paste mineral oil paint and one gallon boiler linseed oil. Mr. Hodge also gives the result of a test of the use of the machine for painting the roofs of 20 box cars of different lengths, one-half of the roofs being painted with a four-knot roof brush and the other half by means of compressed air.

With the brush it required two hours and 40 minutes and 11⅛ gals. of mineral paint. With the air machine it required 40 minutes and 11¼ gals. of paint were used. This represented a saving of 28 cents and the cost paid for material and the wages paid for labor. The same gain is repeated every 40 minutes when the machine is in operation. A second test somewhat similar to the first resulted in a saving of 7½ cents per car by the use of compressed air.

A communication from "A Veteran Painter" was, in part, as follows:

We have been told that the time required to spray a standard 34 ft. box car is 25 minutes; then we are informed, if we want a fair job, that the paint, after it is sprayed on, is gone over with a wide brush, taking 30 minutes more time; or about an hour is required to coat the car body. We have this information from those who advocate the use of the spraying machine, therefore it must be correct. The time spent in cleaning out the hose and nozzle is not given, nor is the time required for replenishing the paint, which may be in a large tank on a truck, or in a gallon can carried in the hand; but in either case two men are needed to operate the machine.

Now I have used the spraying machine for the past year, and have nothing as yet to say in its favor; perhaps it may be improved upon. I would state that I use exactly the same design as some others do who speak so favorably of it. But until there is an improvement for the better, men will prefer to do their painting with the 6-in. flat brush, and they will paint the car as rapidly as they could with the machine, and there is no question but that their work will be done better. Being brushed on, it dries more quickly, which is a very important matter in freight car painting. The drying we find is a serious obstacle with the paint that is applied with the machine; it being uneven and thicker in some places than others. This unevenness has given me considerable trouble when we come to stencil on the lettering, as the paint does not dry well where it is so heavy. It is also rough and unsightly in appearance.

Another objection to the machine painting is that it cannot be used in a shop, owing to the fumes and fine spray which spread over everything. It is very severe on the men, not only in the shop, but outside in the open yard. A slight wind blowing carries the spray and makes it disagreeable to the men working around you within 100 ft. of it.

Some of these objections were satisfactorily answered by those who took part in the discussion, while others were not touched upon.

An English Railroad Strike.

The conspicuous victory which the Amalgamated Society of Railway Servants appeared to win last Christmas over the management of the North Western Railway produced as a natural consequence, first a large accession, stated to be about 5,000, of new members to the union, and secondly a greatly increased confidence on the part of the men in their own strength. The result has been that last week saw the worst railroad strike that we have had in England for a very long time, though there was almost no violence and no wanton destruction of property whatever.

The company attacked was the North Eastern, which has the monopoly of communication in Northumberland, Durham and the larger part of Yorkshire. No one would deny that the North Eastern Company has long been something very like a model employer. Its chairman, Sir Joseph Pease, a grandson of the original chairman of the Stockton & Darlington, and head of one of of the largest coal and iron firms in the world, is a well known and universally respected member of Parliament on the Liberal side. To show the esteem in which he and his family are held, it may be mentioned that a constituency, composed almost exclusively of iron-workers, returned the other day as their member of Parliament, by a large majority, a son of Sir Joseph Pease, who was at that time traveling in the heart of Central Africa and entirely ignorant of what was going on. The General Manager of the North Eastern has also been conspicuous for the exceptional courtesy with which he has treated the Amalgamated Society. The North Eastern was attacked not for its own faults, but because in the northeast of England trade unions in general, and the Amalgamated Society of Railway Servants in particular, are extremely well organized and powerful. It is stated that over 90 per cent. of the North Eastern men in the Newcastle District are trade unionists, and they were, to use the Irish phrase, "spoiling for a fight."

Seven drivers of the drays used for collecting and delivering merchandise were ordered to come on duty at 5 a. m. on Saturday, Feb. 20. This order they disobeyed, claiming that their recognized term of duty only began at 7 a. m. They were suspended, and one set of men after another came out on strike in support of the suspended "rolley-men." The first to strike were shunters and goods guards, but as the movement spread it extended itself also to other branches of the service less immediately concerned. Within two days the goods work at Newcastle and the adjoining towns of Gateshead and Sunderland was practically brought to a standstill. On Wednesday the strike extended to the passenger staff also, and the train service in and around Newcastle was entirely disorganized. By dint of employing country station masters as guards and signalmen, clerks as porters, and so forth, the main line passenger service was kept going, but some of the short branches had to be closed entirely, and the goods and mineral service was practically at a standstill.

So far the strike, bad though it was, had been pretty much confined to Newcastle and its immediate neighborhood. But on Wednesday night matters began to look even more serious. On the one hand it was reported that the men at Leeds and Hull, the other two great centers of the North Eastern system, were prepared to come out on strike in support of their comrades. On the other hand the North Eastern company were taking steps to prosecute their servants for leaving work without notice. The men are, it should be said, bound by the terms of their agreement to give, as they are also entitled to receive, a week's notice before leaving work. That thousands of men had rendered themselves legally liable to fine, and in default of payment to imprisonment, and also to actions for damages for a breach of contract, there is apparently no doubt. But how these penalties and damages were to be practically enforced in the midst of an excited population was the real question. "You cannot," as Lord Chatham said on a more famous occasion, "you cannot draw an indictment against a nation."

At this point Mr. Harford appeared upon the scene and at once had an interview with Mr. Gibb, the General Manager of the company, who apparently undertook that if the whole of the men would go back at once to work, they should all, including the seven suspended rolleymen, be taken on again as though nothing had happened and the prosecutions for breach of contract should be discontinued. Mr. Harford thought these terms reasonable, but at a mass meeting of the men they declined to accept them. Thereupon finding himself not strong enough to carry the men with him immediately, though the strike was in violation not only of the men's contracts with the company, but also of the rules of their own union requiring that no strike should be commenced without the previous consent of the executive council and after an offer of arbitration had been made and failed, Mr. Harford reluctantly put himself at the head of the strike movement.

On Thursday it looked as though the strike was to become very much more serious. Cargo steamers were being diverted from the Tyne ports to Hull and Grimsby, the Northumbrian coal mines were stopping on all sides, and the great iron industry of the Cleveland district was on the point of following the same course. There was more than a chance that if the strike continued it would extend to the remainder of the North Eastern system. The very seriousness of the situation brought its own remedy. With the General Manager of the railroad on the one hand, publicly expressing the readiness of his Board to let bygones be bygones and to discuss all grievances with the men's chosen representatives as soon as the men themselves went back to work, and with Mr. Harford, on the other, acknowledging that he and Mr Gibb could in all probability arrive at a satisfactory settlement between them, there seemed no excuse for continuing the strike merely because the men were conscious of their strength and had lost their tempers. Proposals for a compromise on the terms indicated above were put forward by sections of the staff who were not concerned in the question immediately in dispute, and gradually a majority of the men were talked over into a calmer frame of mind. The mass meeting held on the evening of Friday, Feb. 26, in the Newcastle Town Hall, seems to have been quite dramatic, as the angry determination of the men to go on fighting slowly and gradually gave way to the persuasion of their leaders. In the end a resolution to resume work was carried with only six dissentients. A large number of men resumed work accordingly the following morning, and as I write, three days afterward, I am told that with the exception of one small local ebullition, matters have already pretty much resumed their normal aspect. The meeting between the men's representatives and the directors to discuss, and, if possible, remove, grievances is fixed for March 12.

LONDON, March 2, 1897. W. M. ACWORTH.

TECHNICAL

Manufacturing and Business.

E. M. McIlvain, formerly Assistant to the President and Purchasing Agent of the Bethlehem Iron Co., has been appointed Acting General Sales Agent for the company, with headquarters at South Bethlehem, Pa.

The Bucyrus Co., South Milwaukee, Wis., has recently sold a 50-ton steam shovel to the Des Moines & Kansas City Railroad and two large hydraulic dredges to the United States government. This company reports that it has over $500,000 worth of orders on hand, being under contract to deliver 12 steam shovels by May 10.

The Rand Drill Co., of New York City, has received an order from Norwood, O., for a deep-well air-lift pumping plant which will deliver 1,000,000 gallons of water in 24 hours; also another order from the Atchison, Topeka & Santa Fe Railroad for an air compressor for one of its shops, making in all eight compressors sold to that road.

The annual meeting of the Richmond Locomotive & Machine Works was held at Richmond, Va., March 17, when the following Directors and officers were elected: W. R. Trigg, Joseph Bryan, Lewis Ginter, J. J. Montague and W. H. Palmer. President, W. R. Trigg; Vice-Presidents, Joseph Bryan and J. J. Montague; Secretary, G. F. Jones, and Treasurer, W. G. Ferguson.

The Tredegar Co., of Richmond, Va., has recently received a contract to furnish 10,000 kegs of spikes for the Louisville & Nashville Railroad.

The first shipment of Westinghouse air-brakes manufactured in Hamilton, Ont., by the Westinghouse Mfg. Co., Ltd., will take place next week, to Montreal. Five hundred Canadian Pacific freight cars are at present being equipped with the Westinghouse air brakes, and it is understood that the railroad company has arranged to spend $300,000 a year for three years in equipping the rolling stock with the Westinghouse appliances.

The Bullock Electric Mfg. Co., has been formed to take over the business of the Card Electric Motor & Dynamo Co., of Cincinnati, O. George Bullock will be

President and Treasurer and J. S. Neave Vice-President and Secretary. The Bullock Electric Co. has been organized to handle the sales department of the Bullock Electric Mfg. Co., east of the Allegheny Mountains, with offices in the St. Paul Building, New York City. The company will have branch offices in Boston and Philadelphia. The officers of the Bullock Electric Mfg. Co., as mentioned, held similar positions with the Card Electric Motor & Dynamo Co., and Mr. Bullock and Robert T. Lozier are partners in the Bullock Electric Co.

In our issue of March 5 we stated that the Dickson Mfg. Co. would add a new boiler shop to its works at Scranton, Pa. Construction work has been begun. The new building will be 130 ft. wide and 225 ft. long, and have a steel framework throughout. The sides will be covered with corrugated iron and the roof with composition roofing on plank. The main boiler shop is about 52 ft. wide and 45 ft. high. Thirty feet above the ground is a runway made of substantial steel girders which carry a 30-ton traveling crane. At one end of the main shop is a riveting tower 25 ft. × 50 ft., having a runway carrying a 20-ton crane 50 ft. above the floor level. The crane in the riveting tower runs at right angles to the one in the main shop below. Adjoining the main shop is a punch-room which is about 50 ft. wide, extending the full length of the building. Attached to the roof trusses of this portion is a traveling crane of five tons' capacity, which covers the whole floor surface. Adjoining the punch-shop is a space for the flange fires and other furnaces 25 ft. wide and 225 ft. long. All the main posts of the building are arranged so that jib cranes can be attached to them, and the trusses are arranged so that shafting and other machinery may be attached at convenient points. The steel work was designed and will be furnished and erected by the Berlin Iron Bridge Co., of East Berlin, Conn.

The Manhattan Construction & Equipment Co., of New York City, has been incorporated in this state for the construction and equipment of railroads. The directors are Edward P. Steers, John A. Megargee and Davenant Rodger, all of New York City.

The Colorado Fuel & Iron Co., Pueblo, Col., will add to its plant four new mills at a cost of about $500,000. One will be used for making ingots, another steel rails, the third structural materials and the fourth steel plates. The company is securing estimates for equipping the plant with six electric cranes in addition to other necessary machinery.

The Frank-Kneeland Machine Co., of Pittsburgh, Pa., has recently received orders as follows: Four 10-in. cold rolling mills for the Crescent Steel Co, Pittsburgh; a cold rolling mill and driving arrangement for the Wheeling Steel & Iron Co., Wheeling, W. Va.; two 32-in. and one 38-in. doubling and two 36-in. squaring shears, together with gearing for driving nine pair cold mills for the Pittsburgh Tin Plate Works, New Kensington, Pa.; 10-in. train and 14-in. merchant train, five shears and a 34-in. roll lathe, for the Braeburn Steel Co., Braeburn, Pa.; and one shear to cut 2½ in. square and one to cut 4½ in. square cold steel for the National Rolling Mills, McKeesport, Pa.

The Canadian government has given a contract to the Maryland Steel Co., of Sparrow's Point, Md., for 3,000 tons of rails for the Intercolonial Railway.

Iron and Steel.

The Paxton Iron & Steel Co., Central Iron Works and Chesapeake Nail Works, at Harrisburgh, Pa., have been consolidated under the name of the Central Iron & Steel Co., and the new organization will go into effect May 1. The incorporators are: James McCormick, Charles L. Bailey, J. D. Cameron, Vance C. McCormick, Edward Bailey, G. M. McCauley, W. H. Wallace and J. F. Kernochan.

At the annual meeting of the Lackawanna Iron & Steel Co, held recently in Scranton, Pa., Directors were elected as follows: Samuel Sloan, D. C. Blair, W. E. Dodge, Walter Scranton, M. T. Pyne, S. S. Palmer, James Blair, W. W. Scranton and E. B. Sturges.

The Victoria Furnace Co., which is a reorganization of the Virginia Iron & Railway Co., has recently been chartered. The capital stock is placed at $500,000. The officers are: H. D. Turney, of Columbus, O., President; Decatur Axtell, Vice President, and Vincent Ferguson, Secretary. The company owns a blast furnace at Goshen Bridge, Va, which it is expected to put into operation in the near future.

The Pennsylvania Steel Co. will hereafter roll T-rails at Sparrow's Point, at the plant of the Maryland Steel Co. Orders for girder rails will be filled at Steelton, Pa.

General Manager Price, of the Cambria Iron Co, on March 21 ordered re-sumption of the No. 1 rail mill, which has been closed during the last year. It employs 100 men.

New Stations and Shops.

As a result of petitions made by the citizens of Gulf Port, Miss., a new joint station will be built at that place by the Louisville & Nashville and the Gulf & Ship Island roads.

The Midland Terminal has made plans for a new depot to be built at Victor, Colo. The new building will be of brick and stone and will be 40 × 60 ft. in size. It will cost about $5,000.

The Lehigh & New England proposes erecting a new passenger depot at Deckertown, N. J. Plans have not been prepared as yet.

The new plant of the Atlanta, Knoxville & Northern, at Blue Ridge, Ga., will include a roundhouse of six stalls; a machine shop, 100 × 50 ft.; a car shop, 80 × 50 ft.; a paint shop, blacksmith shop and storeroom. About 100 men will be employed.

Interlocking.

The National Switch and Signal Co., of Easton, Pa., has made a contract with the Chicago, Rock Island & Pacific to put up an interlocking plant at Libertyville, Ia., at the crossing of the Chicago, Ft. Madison & Des Moiner.

Recent Tunneling.

In the February issue of the *Journal* of the Western Society of Engineers appears a paper by Mr. W. J. Yoder describing the Mt. Wood and Top Mill tunnels on the eastern approach to the Ohio River bridge built for the Wheeling Bridge & Terminal Railway. These tunnels were built about eight years ago. One of them is 556.5 ft. long, the other 1,203 ft. They were driven through shale, underlying coal veins, the longer one running much of the way under abandoned coal workings. The shale disintegrates rapidly on exposure and is non-supporting. In the Top Mill tunnel the shale was full of vertical dry seams which caused the material to break into angular masses, leaving cavities outside the section. The irregular roof required considerable packing, and will have a serious effect on the timber in case of sudden and unequal pressure from overhead. In the Mt. Wood tunnel the shale was interspersed with veins of light gray sandstone, and being free from the vertical dry seams better sections were obtained. Most of the bottom of the tunnel is sandstone, giving good foundation for the timbering. It was decided to use the block system of timbering instead of lining at once with masonry. The bad roof of the longer tunnel caused considerable difficulty. At 156 ft. from the portal the overhead rock broke through, letting down fine coal mixed with fireclay and water, and it became evident that the material in the old mine would require support. The tunnel was driven by the use of 3-in. poling boards, 6 ft. long. The lining of both tunnels is of white oak throughout, and it is believed that it will last from 10 to 15 years. The methods of work, the rate of progress, the quantities and the cost are given in considerable detail.

The Pennsylvania's New Ferry-Boats.

The Pennsylvania Railroad has received bids for a third boat of the same design and power as the St. Louis and Pittsburg, which have proved very satisfactory, both as to speed, economy and efficiency, and will commence the building of the third boat at once. The Twenty-third street ferry will be opened in about two months with two boats. These are double-deck screw boats.

McMyler Car-Dumping Machine at Erie.

The Pennsylvania Company has contracted for a McMyler car-dumping machine, to be placed at Erie, Pa. It will be similar to the one erected on the Cleveland, O., docks in 1896. The new machine will handle coal heretofore handled by the old method and will be ready for operation June 1.

Rapid Transit in New York.

The Court of Appeals (state of New York) issued on the 23d a decision pronouncing the Rapit Transit act under which the present Commission is working constitutional. This affirms a decision already rendered in the lower court in the case brought by the New York *Sun* to have the act pronounced unconstitutional. It is probable that the Commissioners will now be able to proceed rapidly toward asking for bids for building and operating the underground road as laid out by them.

M. C. B. Standards.

The Master Car Builders' Committee on the supervision of the standards and recommended practice of the association issues a circular asking suggestions in reference to any such modifications to the established standards and recommended practice of the association as are considered desirable. Replies should go to Mr. R. H. Soule, Superintendent Motive Power, Norfolk & Western Railway Co., Roanoke, Va.

Canadian Government Cement Contract.

The estate of John Battle, of Thorold, Ont., has received the contract for supplying the cement for the Dominion government canals for this year. The contract calls for 30,000 barrels.

THE SCRAP HEAP.

Notes.

A Western paper reports that several freight clerks in Indianapolis have been discharged for giving to agents of the Standard Oil Company information concerning shipments made by other oil companies.

A Chicago paper reports that Wilbur F. Davidson, a man who was struck by a train at Hyde Park, Chicago, just after alighting from a suburbrn train, has received from the Illinois Central road $32,500 damages.

The Secretary of Agriculture has notified the railroads that the provisions of the law requiring the inspection of all meats for export, which were suspended Aug. 28, 1895, are again in force, and that all bills of lading of shipments destined to European ports must bear the certificate of the department. Until otherwise ordered certificates will not be required for beef exported to other than European countries.

The Chicago Great Western has abolished the offices of Trainmaster and of Traveling Engineer, and has appointed "train supervisors," who will combine the functions of both these offices. Frank Slayton and George Gregory, now traveling engineers, will become train supervisors on two divisions, and two other men will be appointed for the two other divisions. The present trainmasters will be transferred to other service.

The flood in the Mississippi River this year appears to be one of the largest ever known, and the press dispatches, especially those from Memphis and vicinity, report widespread damage, with some loss of life; but it does not appear that the damage to substantial buildings has been great or that the interruption of business and railroad traffic has been very serious, though trains had to be suspended on the Little Rock & Memphis for a short time, and there was temporary difficulty on other roads. A press dispatch from Sioux City, Ia., this week reported "many bridges gone," but no definite statements of locality are given.

The legislatures of Arkansas, Missouri and Kansas have adjourned. In the first-named state there will be an extra session beginning about May 1. No laws affecting railroads have been passed, and no one seems able to predict what the extra session will do. In Missouri the bill to fix railroad rates was killed in the Senate. In Kansas there is talk of an extra session, but the railroads may agree on some reductions of freight rates which will forestall action by the Governor. The conference between committees of Kansas, Oklahoma and Texas to see about building a railroad to the Gulf of Mexico will meet in Guthrie before long. Governor Leedy, of Kansas, has appointed two Senators and three Representatives as members of this conference. The lower House of the Utah Legislature has rejected a maximum freight rate bill.

Boiler Explosion on the Lake Shore & Michigan Southern.

On Sunday morning, March 21, the boiler of the locomotive hauling the fast passenger train, No. 10 (Lake Shore & Michigan Southern), which left the Chicago station at 10:30, exploded, killing the engineer and fireman. The accident occurred a short distance west of South Park avenue crossing, while running about 25 miles an hour. No one in the train was injured. The engine was completely wrecked and the tender damaged, although the cars of the train were not injured. Several stock cars standing on a side track were badly broken by flying pieces. This engine was No. 566, built by the Brooks Locomotive Works in 1891, and is of the same type of 10-wheel engine as was used on one division Oct. 25, 1895, in making the special fast run from Chicago to Buffalo. At this time it is not known what caused the explosion.

Manchester Ship Canal.

The Manchester Ship Canal Company furnishes the following statement of sea-going traffic through the canal last year and the year before. The tons of goods in and out were:

	1896.	1895.
Imports, tons	944,558	592,581
Exports, "	565,100	494,862
Totals	1,509,658	1,087,443

Some of the chief articles were, in tons:

	1896.	1895.
Timber	179,859	93 810
Paper and paper making materials	95.478	79 276
Pig iron	56.129	37,556
Manufactured iron	22,980	11,076
Iron ores and pyrites	44,427	21.500
American cotton	44,409	7,041
Egyptian cotton	22.419	18.474
Grain	75.265	16,000
Flour, meal, etc	31,968	14,000
Fruit (green)	27.137	33,061
Sugar	23,131	17,634

A Market for American Oak in France.

There exists in the northern part of France a demand for oak lumber, which is largely applied from the forests of Hungary, and my attention has been called to the fact by dealers in oak lumber that American forests supply a quality of oak which, though said to be slightly inferior to Hungarian oak, could, nevertheless, in a measure, take the place of it. I am informed that, should American dealers in this lumber take the necessary trouble to send agents here, they could, without doubt, secure some of this business. An important firm informs me that they purchase $400,000 worth of oak lumber per year, and that, could they form the proper connections in the United States, they would undoubtedly purchase the entire amount there. They have had small lots of American-grown oak, and state that it has proved satisfactory.

The above is from Mr. Stephen H. Angell, U. S. Consul at Roubaix, who will give further information on request.

Lake Shipping Notes.

Ryan & Clarke will rebuild their elevator at Buffalo, N. Y., which was destroyed by fire March 11. The plans, which have been drawn, provide for an elevator of 200,000 bu. capacity, to cost from $75,000 to $80,000.

R. J. Cram, of Detroit, Mich., has sold to C. S. Barker one of the successful bidders on the Duluth harbor contract, five dredges, with tugs and scows, for $125,000. The dredge fleet to be used by the contractors will consist of 15 very large dredges, about 35 scows and 20 tugs.

D. O. Robinson, who received the contract for erecting the 3,000,000-bu. elevator for the Great Northern Railroad, at Buffalo, N. Y., has sublet the structural steel work to Riter & Conley, of Pittsburgh, Pa., mills of which city will furnish the 7,000 tons of steel required. The building will be 395 ft. long by 120 ft. wide and 160 ft. high, besides engine and boiler rooms. It will have 48 steel grain bins, 75 ft. deep, 30 being 38 ft and 18 18 ft. in diameter, with ½ in. to $\frac{3}{16}$ in. plates. The house will easily handle 500,000 bu. of wheat daily, more than many of the Buffalo houses can handle in a week. It will cost $400,000. The Penn Bridge Co. has the contract for the three grain towers which will travel on the dock alongside the building.

They Will Speak Disrespectfully of the Equator Next.

Scene in English Railway Carriage—A young couple holding the venerated zinc foot-warmer on their laps.—"If your train is not heated by pipes, get plenty of foot-warmers, as Algy and Betty did. Sit on one, put your feet on another, a couple at your back and one on your lap, and you'll get to your destination as they did—warm as muffins!"—*Punch.*

The Anthracite Coal Trade.

The anthracite coal trade continues extremely dull. In February according to the Philadelphia *Public Ledger*, only 19,000 tons in excess of the predetermined 2,500,000 tons were forwarded from the breakers, while for January and February the production exceeded the allotted tonnage of 5,000,000 tons only 360,000 tons. This, says the *Ledger*, is a remarkable record, and illustrates how determinedly the agreement of the producing interests has kept faith instead of piling up a large surplus of stock coal or endeavoring to force on an unwilling market a larger tonnage than was required, at the expense of prices. The anthracite-producing interests appear now to be working in closer harmony than for some time past. Instead of prices weakening as the consumption of coal becomes smaller with the milder weather, they have actually become firmer. This is largely due to the almost unparalleled restriction of the production during the past two months. The mines are now being run only one and a half to three days a week, and that only on three-quarters time. The result is great distress among the colliers and mine laborers, where for the first time in many years, not excepting the periods of the great strikes, towns and boroughs and churches and religious societies have been compelled to appoint committees to collect funds, food and clothing to keep the suffering families of the miners from famishing.

LOCOMOTIVE BUILDING.

It is stated that the New Orleans & Southern is in the market for two locomotives.

The Chicago, Hammond & Western has recently placed an order with the Schenectady Locomotive Works for two new locomotives.

The Brooks Locomotive Works has received an order for four 15 × 22 in., six coupled, side-tank passenger locomotives for the Koya Railway Co. of Japan.

There is no truth in the report which has been going the rounds of the newspapers, and which now appears in the columns of a railroad paper, that the Boston & Maine Railroad has contracted for 25 new locomotives.

The Atchison, Topeka & Santa Fe has asked for bids on eight 10-wheel passenger locomotives, to have 19½ in. × 28-in. cylinders, 73-in. drivers and a total weight of 130,000 lbs. The road will also build 12 locomotives at its shops at Topeka, Kan.

In our last issue we noted a contract for 21 engines given by the Mexican Central to the Brooks Locomotive Works. The specifications as given applied to only 20 of the engines. The other is to be a double-end consolidation engine, with 21 × 26-in. cylinders, for use on heavy mountain grades.

There has been considerable talk about the Russian State railroads being in the market for locomotives. The facts are that the Russian government has let contracts for 500 locomotives, dividing the order among several locomotive works in that country. The government will need 200 more engines, and it is barely possible that contracts may be given to firms in other countries, in which case the United States would probably have first chance. It is the policy of the Russian government, however, not to go outside of its own country for the material unless forced to through lack of facilities at home.

CAR BUILDING.

The Illinois Central is about to build 250 freight cars at its Burnside shops.

The report that the Omaha Packing Co. will shortly order 100 new cars is denied.

It is stated that the Savannah, Florida & Western is in the market for a number of freight cars.

The York Southern Railroad, which was recently made standard gage, has sold 10 of its narrow gage passenger cars to a Peruvian railroad.

The Chesapeake & Ohio has placed an order with the Pullman Palace Car Co. for two vestibuled combination passenger cars. No more passenger cars will be ordered at present.

It is stated that the Coal Blast Transportation Co., which recently placed an order for 100 refrigerator cars with the Wells & French Co., as noted in our issue of March 12, is in the market for 100 more of these cars.

The South Baltimore Car Works, of Baltimore, Md., has received a contract from the Baltimore & Ohio to build 260 coal cars for delivery in May. These cars will be used by the Consolidation Coal Co., George's Creek Coal & Iron Co. and Black, Sheridan & Wilson.

The Haskell & Barker Car Co., of Michigan City, Ind., has been awarded a contract to build 350 coal cars of 80,000 lbs. capacity each for the Chicago & Eastern Illinois Railroad. These cars will have Haskell & Barker's metallic trucks, and will be equipped with Tower couplers.

The Bloomsburg Car Co., of Bloomsburg, Pa., has just shipped two passenger cars to the Dorado Railroad of the United States of Colombia, South America. They are 3-ft. gage, 44 ft. in length over all with 24-in Bloomsburg wheels, link and pin couplers, Scott springs and beamless brakes. On account of the warm climate the windows are fitted with slatted blinds instead of glass and the seats of the cars are all longitudinal and slatted. The Bloomsburg Car Co. is building 20 fruit cars for a road in San Domingo.

The J. M. Jones' Sons Car Works at West Troy, N. Y., is building 15 new motor cars for the Albany City Railroad. The cars, when completed, will be used on the new Cohoes branch of the road.

BRIDGE BUILDING.

Baltimore, Md.—The City Council Committee on Bridges has decided to report favorably on the ordinance appropriating $34,000 to rebuild the bridge over Gwynn's Falls on Wilkens avenue. The present bridge, a wooden structure, is out of repair and unsafe.

Bloomsburg, Pa.—The Bloomsburg & Sullivan is making preparations to replace their Benton bridge with a two-span iron structure. The plans and specifications are reported to be nearly ready.

Brighton, N. Y.—A bill appropriating $13,000 for a boulevard canal bridge in this place has been introduced at Albany.

Brooklyn, N. Y.—The Governor has signed the bill providing for the appropriation of $25,000 for a bridge over Coney Island Creek from West 18th to West 17th street.

Danville, Pa.—The Grand Jury has approved the viewers' report for a county bridge over the North Branch of Mahoning Creek.

Franklin, Pa.—The Allegheny Valley has let the contract for replacing the old wooden bridge over East Sandy Creek, near here, to the Pencoyd Bridge & Construction Co., of Philadelphia, for $20,000. The new structure will be of steel.

Goldsboro, N. C.—Bids are asked, April 5, for a new steel bridge across Neuse River. G. C. Korneyay, County Register.

Greensboro, N. C.—The city authorities and Messrs. Moses & Cæsar Cone, owners of cotton mills near here, are opening an avenue between the city and the mill properties, and purpose building an iron and steel bridge over a creek near the city limits.

Kane, Pa.—Judge Morrison has confirmed the report of the viewers in the bridge case. The Pennsylvania and the city have come to an agreement. The bridge will be an overhead structure spanning the Philadelphia & Erie yard tracks.

Kinston, N. C.—The Commissioners of Lenoir and Greene counties have jointly ordered the erection of an iron bridge over the river dividing the two counties at the site of the present wooden structure known as Edward's bridge. Each county will pay its share, and the Chairman of the Board of Commissioners at this place and Snow Hill, Greene County, will furnish specifications and particulars.

Newberne, N. C.—The Atlantic Coast Line bridge across the Trent River at this place was wrecked last week by a steamer. The railroad will rebuild the bridge at once.

New York.—A bill has been introduced in the Legislature directing the New York & Harlem to build footbridges for pedestrians at 100th street and Park avenue, and 101st street and Park avenue, in this city.

Peckville, Pa.—The Street Committee of Borough Council has been instructed to have plans drawn for a new bridge over Sulphur Creek, on South Main avenue.

Pittsburgh, Pa.—The plans for the new bridge over the Monongahela River at Port Perry have been approved by the War Department.

Titusville, Pa.—The County Commissioners have decided to build the proposed bridge at Brown street. It will be 180 ft. long.

Weldon, N. C.—The Commissioners of Halifax County contemplate building an iron bridge, with stone piers, across the Roanoke River, near this place, to cost about $50,000.

Weston, W. Va.—Among the improvements which the West Virginia & Pittsburgh has begun on its Camden system, five of the largest bridges will be replaced with steel structures.

RAILROAD LAW—NOTES OF DECISIONS.

Injuries to Passengers, Employees and Strangers.

In Virginia it is held that servants of an electric street railroad company are bound to know the difficulty of controlling a car when there is snow on the rails; and where, at such a time, they approach a heavy down grade at such unusual speed as to cause their car to slide down the track, though the brakes are properly set, the company is liable for injuries to a passenger.[1]

In Kentucky one who asks the ticket agent for a first-class ticket, and missing the train, though proceeding immediately after getting the ticket to the depot, takes the next train the following morning, and is put off it, the ticket proving to be a first-class limited ticket, out of date the day previous, may maintain an action of tort for forcible ejection.[2]

In Maryland a passenger on an electric car, who had frequently ridden over the line, in violation of a notice of warning conspicuously posted at each end of the car, stepped on the footboard while the car was in motion, and in preparing to alight struck against an iron post supporting the electric wires, standing 7 in. from the footboard, and was killed. The Court of Appeals holds that he was guilty of negligence precluding a recovery of damages for his death, and where such facts appeared from the undisputed testimony it was not error for the Court to so rule as a matter of law.[3]

In a case in the Federal Courts which has attracted much attention on account of the forcible dissent from the conclusion of the Court by one of the judges, one W., with two companions, purchased tickets at a station of defendant's railroad about 6 o'clock in the afternoon. The train which they were to take passed the station about midnight, and did not stop unless flagged, but defendant's station agent did not mention the latter fact. About midnight, the night then being very dark and misty, W. and his companions returned to the station. The agent had then gone to bed, and there were no lights at the station. A bystander volunteered to signal the train, and did so with a match, but the train ran about 200 ft. beyond the platform before stopping, at which point it could not be seen in the darkess. Another bystander then said to W. and his companions that they could go ahead and get on the train, and W. accordingly started up the track. The train had begun to back down, and ran over and killed W. on the track. The evidence was conflicting as to whether there were any lights on the rear of the train, and whether any audible signal was given before the train began to back down to the station. The Court instructed the jury that if they believed from the evidence that the defendant's employees operating the train could, by the exercise of reasonable care, have avoided killing W., notwithstanding some negligence on his part, then W.'s negligence would not of itself prevent the plaintiff's recovery. There was no evidence tending to show that any of the men on the train had reason to believe that W. was on the track when the train began to set back. The Court of Appeals holds that, in the absence of such evidence, the instruction given was erroneous.[4]

In Illinois negligence cannot be predicted on the absence of a signal light, if a proper light, after being placed in position, was unexpectedly and without fault extinguished when in apparent good order.[5]

In Michigan a railroad section master and the laborers under his control are fellow-servants.[6]

In Illinois a fireman on the first section of a freight train cannot recover for injuries in a collision caused by the negligence of the engineer on the following section.[7]

Also, a yard clerk, whose duty it is to take down the numbers of the cars delivered to his employer, and report the same, without interfering with the work of the switching crew employed in the yard, assumes the risk of their negligence.[8]

In the same state the members of two switching crews of a railroad company, which frequently meet when at work, their relations to each other at such times being governed by considerations of mutual safety and convenience, are fellow-servants.[9]

In Ohio it is laid down that where a rule made it the duty of railroad employees to examine brakes before using them, and a brakeman was injured by reason of the absence of a nut which ordinarily held the brakewheel solid on the shaft, the presumption is that the employee knew of the defect, thereby casting on him the burden of disproving such knowledge, or of showing that, though he did know of the defect he was not negligent in using the brake.[10]

In Illinois a railroad section boss, contrary to the rules of the company, took his wife on a handcar in his charge, as a passenger over the track. They were run into by an engine and in endeavoring to save his wife he was injured. The Supreme Court rules that the company is not liable.[11]

In Illinois it is held that where an engineer, while running a locomotive back and forth over a track in close proximity to a highway, unnecessarily discharges steam so as to frighten a team on the highway, the company is liable for damages caused thereby.[12]

In Rhode Island it is held that where a street car company, authorized by charter to build a street railroad, lets a contract for constructing the road to an independent contractor, without any agreement as to the particular manner in which the work shall be done, it is not liable for injuries caused by a wire stretched across the road by such contractor in the course of the work.[13]

In Illinois running a passenger train at the rate of 25 miles an hour past a station where another train is waiting to receive passengers is held dangerous to persons who may be crossing the tracks to take the waiting train, and is declared to be negligence on the part of the company whose servants are in charge of the moving train.[14]

In Illinois plaintiff with his team was upon the highway approaching a railroad crossing, where the servants of the company were engaged in making repairs. Upon inquiry, he was told by them to cross over, and, in doing so, one of his horses stepped upon a spike in an upturned plank, and was fatally injured. The Supreme Court rules that plaintiff could recover.[15]

In Illinois it is ruled that the mere fact that a policeman is commissioned, at the request of a railroad for guarding its property, and paid by it, does not render the company responsible for his acts.[16]

[1] Danville Street Car Co. v. Payne, 24 S. E. Rep., 904.
[2] L. & N. v. Gaines, 36 S. W. Rep., 174.
[3] State v. L. R. E. R., 34 Atl. Rep., 1110.
[4] St. L. & S. F. v. Whittle (C. C. A.), 74 Fed. Rep., 296.
[5] El., J. & E. v. Malaney, 59 Ill. App., 114.
[6] Gavigan v. L. S. & M. S. (Mich.), 67 N. W. Rep., 1097.
[7] T. H. & I. v. Leeper, 60 Ill. App., 194.
[8] E. St. L. C. Ry. v. O'Hara, 59 Ill. App., 649.
[9] E. J. & E. v. Malaney, 59 Ill. App., 114.
[10] Pitt. & W. v. Ackworth, 10 Ohio Cir. Ct., R. 583.
[11] Mischke v. C., B. & Q., 56 Ill. App., 472.
[12] T. H. & I. v. Doyle, 56 Ill. App., 78.
[13] Sanford v. Pawtucket S. R., 35 Atl. Rep., 67.
[14] C., St. P. & K. C. v. Ryan, 62 Ill. App., 264.
[15] T. H. & I. v. Grandfield, 58 Ill. App., 136.
[16] Hardy v. C., M. & St. P., 58 Ill. App., 278.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

New York, New Haven & Hartford, quarterly, 2 per cent., payable March 31.

Norfolk & Southern, quarterly, 1 per cent., payable April 10.

Pittsburg, Youngstown & Ashtubula, 3 per cent. on common stock and 3½ per cent. on preferred stock, both payable March 25.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Canadian Southern, annual, St. Thomas, Ont., April 7.

Canadian Pacific, annual, Montreal, Can., April 1.

Catawissa, annual, 237 South Third street, Philadelphia, April 6.

Chicago & Alton, annual, Chicago, Ill., April 5.

Joliet & Chicago, annual, Chicago, Ill., April 5.

Lake Shore & Michigan Southern, special, Cleveland, O., and Erie, Pa., May 20.

Panama, annual, 29 Broadway, New York, April 1.

Pittsburgh, Cincinnati, Chicago & St. Louis, annual, Penn avenue and Tenth street, Pittsburgh, Pa., April 13.

Union Pacific, annual, Boston, Mass., April 28.

West Shore, annual, Albany, N. Y., April 21.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Railway Association* will hold its convention at Richmond, Va., on April 7, 1897.

The *National Convention of Railroad Commissioners* will be held at St. Louis, Mo., on May 11, 1897.

The *Association of Railroad Claim Agents* will hold their next meeting at the Southern Hotel, St. Louis, May 26, 1897.

The *Association of American Railway Accounting Officers* will hold a convention at Richmond, Va., on May 26, 1897.

The *Association of Railway Claim Agents* will hold its convention at St. Louis, Mo., during the last week of May, 1897.

The *Master Car Builders' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 8, 1897.

The *American Railway Master Mechanics' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 15, 1897.

The *National Association of Local Freight Agents' Associations* will hold a convention at Washington, D. C., on June 8, 1897.

The *Association of Railway Telegraph Superintendents* will hold a convention at Niagara Falls, N. Y., on June 16, 1897.

The *National Association of Car Service Managers* will hold a convention at Boston, Mass., on June 16, 1897.

The *Train Despatchers' Association of America* will hold a convention at Detroit, Mich., on June 22, 1897.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 25 East Eighth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary.

The *Engineers' Club of Columbus*, (O.), meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Engineers' Society of Western New York* meets on the first Monday of each month at the Society's rooms in the Buffalo Library.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building Roanoke, at 8 p. m.

Western Society of Engineers.

A meeting of the society was held at the Technical Club rooms, 230 South Clark street, Chicago, on Wednesday, March 24. A paper on "Railway Ties in India" by Clement F. Street, M. E., was read in abstract and discussed at the meeting.

Engineers' Club of St Louis.

The regular meeting was held at St. Louis, Mo., Wednesday evening, March 17. A paper by Julius Baier, on "Wind Pressure in the St. Louis Tornado with Special Reference to High Building Construction," was read. This paper was the result of a thorough study of the St. Louis tornado of May 27, 1896. From the known stability of a number of structures wrecked in the storm, the minimum force of the wind was estimated. The theory of tornadoes and a number of observations of tornado effects in other places were given. Instruments for measuring the speed and force of the wind were described, and their limitations defined. Experiments showing the relative pressure and suction action of the wind on various shapes were cited. A large number of lantern slides were exhibited showing views of other tornadoes and views taken after the St. Louis tornado. Following Mr. Baier, Dr. Frankenfield, of the United States Weather Bureau, made a few remarks.

PERSONAL.

—Mr. James J. Hill, President of the Great Northern, sailed for Europe March 17, on the Paris.

—Mr. E. L. Russell has been elected Vice-President of the Mobile & Ohio, of which road he is a director.

—Mr. N. A. Crâmer has been appointed Manager of Eating Houses on the Kansas City, Pittsburgh & Gulf.

—Mr. Ivy T. Preston has been appointed Agent at New Orleans of the Kansas City, Fort Scott & Memphis.

—Mr. H. E. Hutchins has been appointed Assistant Superintendent of the Atlantic & Danville, with headquarters at Norfolk, Va.

—Mr. E. T. Emery has been appointed Car Accountant of the Kansas City, Pittsburgh & Gulf, with headquarters in Kansas City, Mo.

—Mr. W. W. Bromley, General Agent of the Cleveland, Cincinnati, Chicago & St. Louis, at Milwaukee, Wis., died in Chicago, on March 12.

—Mr. J. C. Lincoln has been appointed First Assistant General Freight Agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern.

—Capt. James W. Martin, Superintendent of Steamship Lines of the Flint & Pere Marquette, died at his home in Milwaukee, Wis., on March 21.

—Mr. A. Landry has been appointed General Agent of the Gulf, Colorado & Santa Fe, with headquarters at New Orleans, to succeed Mr. M. W. Joyce, deceased.

—Mr. George E. Ayer, formerly Roadmaster of the Atchison, Topeka & Santa Fe, at Trinidad, Col., has been appointed Trainmaster of that road at San Marcial, N. Mex.

—Mr. A. Anderson has been appointed Commercial Agent of the Atchison, Topeka & Santa Fe, with headquarters at Milwaukee, Wis., to succeed Mr. R. H. Davis, resigned.

—Mr. James Blair died at his home in Scranton, Pa., on March 18. Mr. Blair was a large stockholder, and for a number of years a Director, of the Delaware, Lackawanna & Western.

—Mr. M. S. Frost, who at one time was President of the Pittsburgh, Shenango & Lake Erie and later President of the Northwestern Equipment Co., Chicago, died in Detroit, Mich., March 13.

—Mr. Peter A. Ahl, who was for some years President of the Harrisburg & Potomac, now owned by the Philadelphia & Reading, died at his home in Newville, Pa., on March 21, aged about 80 years.

—Mr. Arthur Woolford, formerly Auditor of the Suffolk & Carolina, with headquarters at Suffolk, Va., has been appointed Auditor of the Queen Anne's Railroad, with headquarters at Queenstown, Md.

—Mr. Orsemus R. Fyler has been nominated by Governor Cooke of Connecticut to succeed Alexande. C. Robertson, of the Connecticut Board of Railroad Commissioners, whose term expires on July 1.

—Mr. John Gill, formerly General Foreman of the Chicago, Rock Island & Pacific, at Horton, Kan., has been appointed Master Mechanic of the Illinois Division of that road, with headquarters at Chicago.

—Mr. Peter J. Somers has been elected General Solicitor of the Mexican Southeastern Railroad, which is projected by American capitalists from a point on the National Tehuantepec southwest to the Guatemala line.

—Mr. S. A. Sheppard, Master Mechanic of the Carrabelle, Tallahassee & Georgia, died at his home at Lanark, Fla., on March 15. Mr. Sheppard was a member of the American Railway Master Mechanics' Association.

—Mr. W. S. Morrison has been appointed Traveling Passenger Agent for the Erie Railroad, with headquarters in Huntington, Ind., to succeed Mr. W. G. MacEdward, who was lately transferred to Elmira N. Y.

—Mr. Charles W. Randall has been appointed General Western Freight Agent at Chicago of the Southwest System of the Pennsylvania Company to succeed Mr. J. B. Hill, promoted. The appointment will take effect April 1.

—Mr. Charles C. Benson, Ticket Agent of the Maine Central, at Lewiston, Me., was elected President of the International Association of Ticket Agents, at its seventh annual meeting, held at San Antonio, Tex., on March 10.

—Mr. J. C. Heitbahn, Local Freight Agent of the Chicago, Milwaukee & St. Paul, at Chicago, died suddenly at his home in that city, on March 14. Mr. Heitbahn had been in the service of the Chicago, Milwaukee & St. Paul since 1884.

—Mr. C. A. Boyden has been appointed Traveling Freight Agent of the Chicago, Milwaukee & St. Paul, with headquarters at Cleveland, O., to succeed Mr. W. W. Hall, who was recently appointed Commercial Agent of the company at Pittsburgh, Pa.

—Mr. H. M. Clay has been appointed General Agent of the Passenger Department of the Union Pacific, with headquarters at Salt Lake City, to succeed Mr. D. E. Burley, who has been appointed General Passenger and Ticket Agent of the Oregon Short Line.

—Mr. H. Abbott, General Superintendent of the Pacific Division of the Canadian Pacific, has resigned. Mr. Abbott has been connected with the Canadian Pacific since 1881, and previous to that was engaged in engineering work in connection with certain roads in eastern Canada.

—Mr. W. G. Nevin, General Purchasing Agent of the Atchison, Topeka & Santa Fe, with headquarters in Chicago, has been appointed General Manager of the Southern California, to succeed Kirkland H. Wade, deceased. Mr. Nevin's headquarters will be at Los Angeles, Cal. He will probably be succeeded as General Purchasing Agent of the Atchison, Topeka & Santa Fe by Mr. C. M. Higginson.

—Mr. Waldo H. Marshall, now editor of the *American Engineer, Car Builder and Railroad Journal*, New York, will go to the Chicago & Northwestern on May 1 as Assistant Superintendent of Motive Power and Machinery, taking the place made vacant by Mr. E. M. Herr, who recently went to the Northern Pacific as Superintendent of Motive Power. Mr. Marshall's present position will be taken by Mr. G. M. Basford, now one of the editors of the *Railway Review*, Chicago. Mr. Basford's position as Secretary of the Western Railway Club will be vacated by him May 1.

—Mr. John King, for almost 10 years President of the Erie Railroad, and afterward, from July, 1893, to April, 1895, one of the receivers, died at Beaulieu, near Nice, France, March 17. Mr. King was born in Baltimore, Md., April 24, 1832, and began his railroad career as a ticket agent at a small suburban station on the Baltimore & Ohio. He served on this road for 27 years, during which time he filled successively the offices of Paymaster, Auditor, General Freight Agent, Vice-President and Acting President. In 1875 he was elected President of the Pittsburgh & Connellsville Railroad, appointed Receiver of the Ohio & Mississippi Railroad in November, 1876, and Receiver of the Marietta & Cincinnati Railroad in June, 1877. He resigned these positions in 1881, on account of ill health, and went abroad, returning to this country in August, 1884, when he entered the service of the Erie Railroad as Assistant to President Hugh J. Jewett. In November of the same year he succeeded Mr. Jewett as President, and remained in that position until his appointment as Receiver. Mr. King's mother was a sister of John W. Garrett, President of the Baltimore & Ohio Railroad from Nov. 17, 1858, until his death in October, 1884. A widow, one son and two daughters survive him. Mr. King was prominent in society and was a member of many clubs.

ELECTIONS AND APPOINTMENTS.

Burlington & Grand Isle.—At a meeting of the Directors of this proposed road in Vermont, held recently, the following officers were elected: President, F. O. Sinclair; Vice-President, O. W. Peck; Secretary, H. N. Camp; Treasurer, C. A. Barber.

Central Texas & Northwestern.—At a meeting of the stockholders, held in Waxahachie, Tex., March 15, the present Board of Directors was re-elected. The Directors then elected officers as follows: President, T. H. Hubbard, New York City; Vice-President, Hans Helland; Secretary and Treasurer, W. C. Kelly.

Cleveland, Akron & Columbus.—At the annual meeting of stockholders, held in Cleveland, O., March 19, the present Board of Directors was re-elected as follows: Calvin S. Brice, S. M. Brice, Samuel Thomas, E. R. Thomas, Andrew Squire, C. N. Haskell and A. L. Conger.

Cleveland & Marietta.—At the annual meeting of stockholders, held on March 11, directors were elected as follows: W. A. Baldwin, A. J. Warner, J. T. Brooks, John E. Davidson and Thomas DeWitt Cuyler.

Des Moines Union.—At the annual meeting, held recently in Des Moines, officers for the ensuing year were elected as follows: President, F. C. Hubbell; Vice-President, A. B. Cummins; Secretary, F. M. Hubbell; Treasurer, H. D. Thompson.

Erie Eastern.—Officers of this company have been elected as follows: President, A. L. Tilden; Vice-President, J. A. Bolard; Treasurer, L. G. Reed; Secretary, J. J. Roemer.

Fort Worth & New Orleans.—At a stockholders' meeting, held recently in Waxahachie, Tex., the present Board of Directors was re-elected. The directors then elected officers as follows: President, T. H. Hubbard, New York City; Vice-President, Hans Helland; Secretary and Treasurer, W. C. Kelly; Assistant Secretary and Assistant Treasurer, E. W. Cave.

Gulf, Louisiana & Great Northern.—The officers of this company, recently incorporated in Louisiana, are: Joseph J. Waitz, President and General Manager, Atchison, Kan.; William J. Lees, Vice-President, and C. F. Rock, Secretary.

Kansas City, Pittsburg & Gulf.—M. L. Scoville has been appointed Assistant General Freight Agent, with headquarters at Shreveport, La. R. W. Lightburne, Jr., has been appointed General Agent at New Orleans.

Lexington & Eastern.—George Copland has been elected Vice-President, and J. R. Barr, General Manager; both of these offices were formerly held by James D. Livingston, who has resigned. George F. Foster having resigned as Master Mechanic and Acting Train Master, these offices having been abolished, and E. R. McCuen has been appointed General Foreman in charge of the Mechanical Department, with supervision over all work connected with the repairs and maintenance of equipment.

Missouri Pacific.—At a meeting of the Board of Directors, held in New York on March 17, officers were elected as follows: President, George J. Gould; Vice-President and General Auditor, C. G. Warner; General Manager, W. B. Doddridge; Secretary and Treasurer, A. H. Calef; Assistant Secretary, Guy Phillips; Second Assistant Secretary, F. W. Irland; Local Treasurer, D. S. H. Smith.

Ogdensburgh & Lake Champlain.—Receiver Charles S. Parsons has appointed Charles N. Chevalier Superintendent; F. J. Carrigan, Trainmaster; H. E. Keeler, Chief Train Dispatcher, and M. A. Hodge, Traffic Manager, all with headquarters in Ogdensburg.

Pennsylvania.—The following appointments took effect on March 15: E. E. Lippincott, Supervisor of Division No. 17, with headquarters at West Brownsville, Pa., to succeed Frank Culbertson, transferred; J. K. Stewart, Supervisor of Division No. 2, with headquarters at Paoli, Pa., to succeed J. K. Johnston, promoted; J. B. Baker, Assistant Engineer of the Pittsburgh Division, with headquarters at Pittsburgh, Pa., to succeed R. L. O'Donnell, promoted; Frank Culbertson, Supervisor of Division No 22, with headquarters at Osceola, Pa., to succeed E. E. Lippincott, transferred.

St. Louis, Iron Mountain & Southern.—At a meeting of the Directors, held in New York March 17, officers were elected as follows: President, George J. Gould; Vice-President and General Auditor, C. G. Warner; General Manager, W. B. Doddridge; Secretary and Treasurer, A. H. Calef, Assistant Secretary, Guy Phillips; Second Assistant Secretary, E. G. Merriam; Local Treasurer, D. S. H. Smith.

Santa Clara Valley.—The officers of this road, which is proposed in California, are: President, R. J. R. Aden; Vallejo, Cal.; Secretary, H. P. Thayer; Chief Engineer, Charles Herrmann, San Jose, Cal.

Tennessee Coal, Iron & Railroad Co.—The directors have elected officers as follows: President, N. Baxter, Jr.; First Vice-President and Treasurer, J. Bowron; Second Vice-President, A. M. Shook.

Texas & Pacific.—At the annual meeting of stockholders, held in New York City on March 17, the present Board of Directors was re-elected. The Directors then re-elected the following officers: President, George J. Gould; Vice-President, S. H. H. Clark; Secretary and Treasurer, C. E. Satterlee; Third Vice-President and General Manager, L. S. Thorne.

Wilmington Seacoast.—The new Board of Directors has elected officers as follows: President, George R. French; Vice-President, G. H. Smith; Secretary and Treasurer, W. P. Toomer; Traffic Manager, E. S. Latimer; General Auditor, John S. Armstrong; Superintendent, R. Oscar Grant.

Zanesville Terminal.—At the annual meeting of stockholders, held in Columbus, O., March 17, the following Board of Directors was elected: Chase Andrews, J. F. Maury, W. O. Henderson, G. C. Hoover and Theodore Leonard.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Burlington & Grand Isle.—This road is proposed to extend from Winooski, a station on the Central Vermont, in Chittenden County, Vt., northeast to Colchester, and thence northwest, skirting Mallett's Bay to Sandbar bridge, over which it will pass to Grand Isle, in Lake Champlain. On the island the route passes through South Hero, Keeler's Bay and Pearl, to Grand Isle village. The total length of this proposed line is about 20 miles. Surveys are to begin at once.

Canadian Roads.—Application is being made to Parliament by Messrs. Bisaillon, Brosseau & Lagoie, of Montreal, for a charter to build a road from a point on the south shore of the St. Lawrence River, in the County of Chambly, through the counties of Chambly, Verchéres, Rouville, St. Hyacinthe, Laprairie, St. John, Iberville, Missisquoi, Brome, Shefford, Stanstead and Sherbrooke, to a point in the city of Sherbrooke.

Chicago & Lake Superior.—This company, which recently went into the hands of a Receiver, after building about three miles of road from Cambridge to London, in Dane County, Wis., has been reorganized and new articles of organization were filed in Wisconsin on March 16. The company proposes building a line from a point on the Southern state line, probably in Walworth County, through Wisconsin in a general northwesterly direction to Superior, Douglas County, on Lake Superior, a total of about 330 miles, passing through the counties of Racine, Walworth, Rock, Jefferson, Dane, Columbia, Green Lake, Marquette, Adams, Waushara, Waupaca, Portage, Wood, Clark, Marathon, Chippewa, Taylor, Price, Sawyer, Douglas, Bayfield, Ashland and Iron. The capital stock is $1,000,000 and the incorporators are Abram H. Haddfield, George Dow, George Dow, Jr., Robe Dow, Mark Patek, Amos J. Allen, and Charles Friend.

Golden Circle.—Colorado papers report that this road is soon to be extended from Goldfield, Col., around the eastern side of Battle Mountain, to the Portland mine and from this point around the southern and western slopes of Battle Mountain to Altman and thence to the Buena Vista mine and the Gold Crater mines, on the summit of Globe Hill. It is stated that surveys have been made to the Portland mine and that active work will be begun within a short time.

Gulf, Louisiana & Great Northern.—This company has been chartered in Louisiana to build a railroad from a point on Vermillion Bay, La., on the Gulf of Mexico, north to Fort Smith, Ark. It is stated that 87 miles of the proposed line have been surveyed in Louisiana, between Arcadia and a point on Red River, near Boyce. It is expected that contracts for building the line will be let within a short time. The capital stock of the company is $4,000,000. Incorporators, Joseph J. Waitz, A. P. Bose, John J. Baulch and others.

Little Kanawha Valley.—This company proposes to build a road from Parkersburg, W. Va., through Wood, Calhoun, Gilmer and Braxton counties to a connection with the West Virginia & Pittsburgh, making a connection with the Ohio River Railroad at Parkersburg. The road, which will be about 140 miles long, will follow the valley of the Little Kanawha River and will pass through Elizabeth, Grantsville, Glenville and Burnesville, the chief towns of that section of West Virginia. It is expected to develop a strip of country which has heretofore depended upon the Little Kanawha River for its transportation facilities. Work will begin as soon as contracts can be arranged, the money having been provided through county and district subscriptions and a bond issue floated in New York. The road would have been begun last fall but for an injunction secured by Parkersburg people against the payment of a subscription of $175,000 by Parkersburg District, of Wood County. This injunction was carried to the State Supreme Court, and a decision favorable to the company was finally secured. It is expected that grading will begin within 30 days, and that the road will be completed to Burning Springs, about 20 miles, by fall.

Mississippi River & Northwestern.—It is announced that this road is to be extended through Pendleton and Stuttgart to Hot Springs, Ark.

New Roads.—It is reported that a narrow-gage road, 14 miles in length, will be built in Maine, between Farmington Village, Farmington Falls and New Sharon. It is expected that work on ths line will be begun within a short time, as the charter calls for its completion on or before Dec. 1, 1897. Surveys of the line have all been completed. It is expected to continue the road from New Sharon to Waterville, via Mercer, Norridgewock and Oakland, within two years. A connection is proposed with the Wiscasset & Quebec, by which it is expected to obtain a winter harbor for all the places along the route from Rangeley to Wiscasset.

Surveys are being made for a line which is projected as an extension of the Sonora Railway from its present terminus at Guaymas, Mex., on the Gulf of California, southeast about 450 miles along the coast to Mazatlan. The route passes through a number of important coast towns and it is expected to open up a rich agricultural district.

Arrangements have been completed by Henry McLaughlin and the Messrs. Robinson, of Pensacola, Fla.; R. H. Elliot, of Birmingham, Ala., and others for a survey for a road to extend from Jasper, Walker County, Ala., which is in the heart of the Birmingham mining district, south to Pensacola, Fla. It is proposed to apply for a charter within a few days. Mr. McLaughlin owns 30 miles of road extending from Pensacola north, which will be used in connection with the new line.

Pennsylvania.—Work is progressing rapidly on the improvements near Radebaugh. It is expected that the tunnel will be completed and ready for track-laying by May 1, and that grading will have been completed in about a month. A new cut is now being made for the purpose of straightening the line about half a mile from the entrance of the tunnel.

St. Joseph Valley.—This company has purchased the franchise held by J. M. Caulfield for a road to extend from St. Joseph, Mich., southeast about 50 miles, to Napanee, Ind. It is now expected that the road will be built.

St. Louis, Mansfield & Ava Southern.—A contract for building the first 10 miles of this road, from Ava, Douglas County, Mo., north to Mansfield, has been given to the Ozark Construction Co., of Springfield, Mo., and it is proposed to begin work at once. The company was organized at Mansfield, in March, 1896, to build a road from Ava, through Mansfield, to a connection with the St. Louis & San Francisco, in Laclede County.

Santa Clara Valley.—It is reported that surveys have been completed for this road in California, which is proposed from San Jose northwest about nine miles to Alviso, all in Santa Clara County. Right of way has already been secured, and it is expected that contracts will be let within a few days. A list of officers of the company is given in another column.

Sioux City & Western.—Articles of incorporation of this company were filed at Lincoln, Neb., March 12, by James E. Booge, L. F. Wakefield, F. A. Seaman, Donald McLean and M. F. Harrington. The capital stock named is $5,000,000. It is proposed to build a road from O'Neill, Holt County, Neb., a station at the junction of the Frement, Elkhorn & Missouri Valley and Sioux City, O'Neill & Western roads in a general westerly direction through Holt, Rock, Brown, Cherry, Sheridan, Boxbutte, Dawes and Sioux counties to a point, not named, in Sioux County in the northwestern part of the state.

Sparks, Moultrie & Gulf.—This road, which is being built from Sparks, Berrien County, Ga., west 23 miles to Moultrie, Colquitt County, has been completed to within two miles of Moultrie. At Sparks connection is made with the Georgia Southern & Florida, and at Moultrie it is expected to make connection with the Georgia Northern, a line which extends from Pidcock north 31 miles to Moultrie. It is claimed that this line will make a valuable feeder for the Georgia, Southern & Florida, particularly in naval store traffic, there being a considerable stretch of pine timber in Colquitt County.

Stone Mountain.—President G. W. Hinshaw states that it is the purpose of the company to build a line from a point on the Greensboro & Wilkesboro division of the Southern, at or near North Wilkesboro, N. C., north 20 miles to Stone Mountain, and thence across the Blue Ridge in Allegheny County, and from that point by one of the two following routes: The first extends in a northwesterly direction through Allegheny and Ashe counties to the Tennessee or Virginia state line, where connection is proposed with a road now being built from Abingdon, Va., northwest into the coalfields of Scott, Wise and Russell counties, Va., and southeast to the North Carolina or Tennessee line. The second proposed route extends in a westerly direction through Allegheny and Ashe counties to the Tennessee line and thence on to Bristol, Tenn. Fifteen miles of the Abingdon connection have been graded and surveys are now being made to Stone Mountain. It is expected that the road, if built, will form a link in the Southern system, connecting the Greensboro & Wilkesboro division at Wilkesboro with the Norfolk & Western at Abingdon or with the Bristol & Chattanooga division at Bristol. The capital stock of the company is $200,000, which amount is expected to be increased to $15,000 per mile when work on the line is begun. The principal office is at Winston, N. C.

Electric Railroad Construction.

Albany, N. Y.—The Greenbush & Nassau Electric Railway Co. has been incorporated to build an electric road from the Greenbush approach of the Albany bridge to Nassau, a distance of 17 miles. The capital stock is $180,000, consisting of shares of $100 each. Among the directors are: W. D. Barnes, of Brainard Station; S. C. Curran, East Greenbush; F. Carr and W. H. Nichols, Greenbush, and T. W. Cantwell, of Albany.

Baltimore, Md.—The Falls Road Electric Railway Co. intend to begin the construction of its line in the course of the next few weeks. Plans are being prepared for a car shed at Mt. Washington 80 by 200 ft.

Benton Harbor, Mich.—The Century Engineering Co., of Cleveland, O., has contracted for 100 miles of electric railroad, to be completed by September next. The road will commence at Benton Harbor, Mich., and run by private right of way through a fine fruit country to Sister Lakes, branching north to Allegon and south to Casopolis. The first 15 miles of road will be laid with 80-lb. T-rail, and the balance of 70-lb. on cedar ties. There will be passenger, freight and standard fruit cars. The company will use Scotch boilers and engines of the inverted direct connected type; cylinder, 20 and 40 in. diameter, by 30-in. stroke, which will develop 700 I. H. P., at ⅓ cut-off. The boilers are about 12 × 12 ft., and designed to carry 125 lbs. pressure. There are to be four power-houses on the line. Each station to feed 15 miles each way, and to be equipped with two direct-connected 400 K. W., except at Benton Harbor, that station having three direct-connected 400 K. W. The Benton Harbor Electric Railway and Transit Co., by whom the contract is let, proposes to run a boat line from Benton Harbor to Chicago and Milwaukee.

Bridgewater, Mass.—The Bridgewater, Whitman & Rockland Railway Co. has accepted the terms of the franchise offered by the Selectmen.

Brooklyn.—The Nassau Electric Railroad Co. of Brooklyn is erecting a large passenger station at its Coney Island terminus. The building, which is of wood, has a frontage of 160 ft. on Surf avenue and is to be 250 ft. deep. The estimated cost is $12,000.

East Liverpool, O.—The South Side Street Railway Co. has been granted a 24-year franchise for the proposed road to enter the city by the new South Side bridge. Construction work will begin within a few weeks.

Hamilton, Ont.—At a meeting of the shareholders of the Hamilton, Chedoke & Ancaster Radial Railway a resolution was passed to obtain the necessary grants from the legislature to extend the road to Brantford. The estimated cost is $200,000.

Jamaica, L. I.—The Long Island Railroad Co. will build a one-story car barn and power-house at Jamaica. The building will be 88×264 ft. and contain a boiler-room, engine-room and car shed. Architect Charles McCall, 10 North Eleventh street, Philadelphia, will let separate contracts for the work.

Lewiston, N. Y.—The one mile extension of the Lewiston & Youngstown Electric Railroad to Rumsey Park was begun March 13. Cars will then be run direct from Buffalo to the park.

Marietta, O.—F. J. Cutter, representative of the company which proposes to build a line from Marietta, O., to Parkersburgh, W. Va., informs us that the matter of granting a franchise will be considered by the County Court on April 5. As stated in our issue of Feb. 26, Gen. J. E. Lowes, of Dayton, O., and Colonel H. D. Knox, of Marietta, have made the application. The route as outlined is from Parkersburgh up the river to Williamstown, a distance of about 13 miles, and thence back on the Williamstown Pike to the St. Mary's Pike via Valley Mills to Parkersburgh, thus forming a belt line about 14 or 15 miles in length. As stated among our bridge notes recently, a company has been incorporated by some Pittsburgh capitalists for the construction of a large bridge across the Ohio River between Marietta and Williamstown. The new line will probably pass over this bridge when constructed.

Newtown, Pa.—The East Penn Traction Co. has been granted permission to build a line from east to west in the borough along Washington avenue, and ordinances giving similar permission have passed second reading in Moundsville and Yardley, the two other boroughs between Trenton and Newtown. An effort is also being made to get right of way between Newtown and Doylestown on the turnpike, passing through Wrightstown, Pineville, Buckingham and Mechanicsville. This route will give a through line between Trenton and Doylestown, a distance of about 24miles.

New York.—On March 20 the New York State Railroad Commissioners granted the Metropolitan Street Railway Co. permission to build the electric conduit road. As soon as the consent of the Commissioner of Public Works for tearing up the streets is obtained, work involving the expenditure of over $6,000,000 will be commenced. Full particulars of the construction and a map showing the route of the conduit roads was published in the *Railroad Gazette* March 5.

Norwalk, Conn.—The White-Crosby Co., of Baltimore, has been given the contract to build three miles of extension to Westport for the Norwalk Tramway. The contract includes both track and overhead work, and is an extension of the present electric road. The material is now on the ground and the work well under way.

Norway, Me.—The incorporators of the Oxford Central Electric Railroad have elected the following officers: President, F. C. Wilson, Boston; Clerk, Freeman Howe, Norway; Treasurer, S. S. Sterns, Norway; Attorney, J. S. Wright, South Paris; Directors, Eben C. Wilson, Boston; E. W. Eastman, Auburn; Freeman Howe, Norway; L. H. Burnham, Albany; Col. A. S. Hapgood, Waterford; B. G. McIntire, Waterford; Jonathan Bartlett, Stoneham. It has been decided to build from Norway to Rice's Junction, thence a branch to South Waterford, and another to East Stoneham, a distance of 21 miles. The estimated cost is $200,000.

Penn Yan, N. Y.—The Penn Yan Board of Trustees has granted a franchise to the Penn Yan, Keuka Park & Branchport Electric Railroad Co., referred to among our notes March 5.

Philadelphia, Pa.—A sub-committee of the committee on street railroads, has decided to report favorably to the general committee the ordinance authorizing the Union Traction Co. to extend the Thirteenth & Fifteenth streets line on Broad street to the League Island Navy Yard.

At a meeting of the Executive Committee of the Union Traction Co on Monday of this week plans were submitted for the new power-house at Thirteenth and Mount Vernon streets. It is proposed to build the new plant similar to the old one; the dynamos are to be of 8,000 H. P. It has been decided to put 1,000 additional horse power in the Beach street power-house.

Portland, Me.—The Portland & Cape Elizabeth Electric Railroad Co. is making active preparations to extend its tracks from Willard to Delano Park.

Quebec, Que.—Work on the new electric railroad in Quebec, to which we have previously referred, will be resumed next month. The cars are being made by Ahern & Soper, of Ottawa.

Reading, Pa.—It is proposed to build an electric road between Reading and Bernville, a distance of about 13 miles, the line to follow closely the route of the abandoned Union Canal. The estimated cost is $100,000, of which $50,000 is to be raised by subscription and $50,000 in bonds.

Richmond, Ind.—A new electric railroad is proposed to run from Richmond, Ind., to College Corner, O., a distance of over 25 miles.

St. Louis.—On March 10 the St. Louis County Court at Clayton granted a franchise to the St. Louis, Fenton & Southwestern Railway Co., to build a single or double track electric railroad through the county, from the southwestern limits of St. Louis at Loughborough avenue in Carondelet to the western limits of St. Louis County at Fenton. The route traverses private property the entire distance, except where it passes through the streets of Carondelet and Fenton.

Savannah, Ga.—The Savannah Traction Co. has just closed a contract for 50-lb. T-rails to be used on the new extensions.

Syracuse, N. Y.—The Rapid Transit Co. has asked for franchises to enable them to extend its lines on many of the streets in the city.

Washington, D. C.—The Metropolitan Railroad Co. has been granted permission to extend its line along Columbia Road. The extension is about seven-eighths of a mile in length, and the road will be double track. Construction will be similar to the lines now in operation by the Metropolitan Railroad Co.

GENERAL RAILROAD NEWS.

Baltimore & Ohio.—Earnings for January and for the seven months ending Jan. 31 were:

January:	1897.	1896.	Inc or Dec.
Gross earn.	$1,956,844	$1,817,932	I. $132,912
Oper expen.	1,659,562	1,404,729	I. 254,833
Net earn.	$291,282	$413,203	D. $121,921
Seven months:			
Gross earn	$15,464,193	$14,550,948	I. $913,245
Oper. expen.	11,788,099	10,032,860	I. 1,755,239
Net earn.	$3,676,094	$4,518,088	D. $841,994

Receivers John K. Cowen and Oscar G. Murray have prepared a statement of their expenditures from March 1, 1896, to Feb. 1, 1897, for additions to the plant, equipment and betterments. The total amount expended was $6,989,211, of which $2,027,293 was spent by the engineering department and the remainder by the motive power department. A total of $18,000 was spent for betterments to locomotives, and $233,000 for betterments to cars, both freight and pas-

senger. Seventy-five new locomotives and 5,000 new freight cars were added to the equipment last summer at a cost of about $3,300,000, and extraordinary repairs to locomotives, passenger and freight equipment amounted to $1,348,000. In the engineering department $583,000 was spent on new rails and $105,000 on new bridges; $58,000 was spent in arching and improving tunnels. The improvements at Myer's Hole, on the Second Division, cost about $33,000, and those in the Cumberland Terminal, $182,000. The new work on the Glenwood Cut Off cost about $430,000. Among miscellaneous improvements, about $190,000 was spent in general betterments of the lines east of the Ohio River; at Harper's Ferry $39,000 was spent in general improvements, and the sidings placed in certain of the lines east of the Ohio River cost $98,000.

Baltimore & Ohio Southwestern.—The Farmers' Loan & Trust Co. of New York has brought suit against this company, the Baltimore & Ohio Railroad, and other holders of the consolidated mortgage bonds. The Trust company, as trustee of the property, has certified $12,000,000 bonds issued to take up the Ohio & Mississippi first liens The new bonds were guaranteed by the Baltimore & Ohio, but the latter under the receivership is unable to make its guarantee good. The company has notified the trust company that it is unable to pay the Ohio & Mississippi bonds at maturity, and proposes a 50 years' extension at 4 per cent. The plaintiff asks the advice of the court in the interests of the holders of the bonds, payment of which will default unless such extension is obtained.

Central of Georgia.—Suit has been brought in the United States Circuit Court at Savannah, Ga., against this road by King & Spaulding, representing the Louisville & Nashville. The object of the suit is to establish the right of the latter company as sole owner of the lease of the Georgia Railroad The bill which was filed recites the history of the Georgia Railroad lease to William Wadley, the transfer by him to the Louisville & Nashville and the Central Railroad & Banking Co. of Georgia, the Receivership of the Central, the purchase of its assets by Thomas and Ryan and the reorganization under the name of the Central of Georgia Railway Co. It is shown that this interest in the Georgia Railroad lease was pledged to secure a debt in New York, and that it was sold in default of the payment of that debt and bid in by the Mercantile Trust Co. The company claims that the lease contract was not an assignable paper, and that neither Thomas and Ryan nor the Central of Georgia owns it.

Cleveland & Pittsburgh.—The annual report of the company for the year ending Dec. 31 was issued on March 18. The report shows total gross earnings for the year to have been $3,226,614, a decrease of $328,883 from 1895. Of this total amount freight earnings amounted to $2,506,955. The operating expenses and taxes amounted to $2,057,653, making the net earnings $1,168,961. The general balance sheet of Nov. 30 shows the total assets to have been $20,531,752, of which the road and equipment amounted to $18,969,148. The capital stock was given as $11,247,529, the funded debt, less bonds in sinking fund, $6,050,370, and the balance of the income account $2,948,200.

Columbus, Hocking Valley & Toledo.—The Central Trust Co. of New York has brought suit in the United States Circuit Court, at Columbus, O., against the company to foreclose the mortgage of $14,500,000 given in 1881. The Hocking Coal & Railway Co. and the Knickerbocker & Atlantic Trust Co. are also made defendant parties. The suit is based upon the allegation that the company is insolvent, having defaulted the payment of $200,000 interest due March 1.

Lake Shore & Michigan Southern.—A special meeting of the stockholders has been called for May 20 in both Cleveland, O., and Erie, Pa., to take action and vote on the proposal to increase the indebtedness of the company by the issue of bonds for an aggregate principal sum not exceeding $50,000,000, payable June 1, 1997, and bearing interest at 3½ per cent. per annum. It is proposed as a security for said bonds to execute a mortgage to some trust company in New York City or to some other trustee or trustees, on any or all of the railroads, leasehold interest, equipment and franchises and income of the company.

Little Rock & Memphis.—The foreclosure sale of this road, which had been arranged for March 17, has been postponed until June 10. This is the fifth time that the sale has been postponed in the last two years.

Louisville & Nashville.—In accordance with a term of the sinking fund clause in regard to the Cecilia Branch mortgage, $55,000 has been deposited with the Union Trust Co., of New York, as trustee for the purchase of bonds of this issue at par. The Cecilia Branch extends from Louisville, Ky., to Cecilia, Tex., a distance of 46 miles. It is owned by the company, but is leased to the Chesapeake, Ohio & Southwestern at $60,000 per annum.

Mexican National.—Earnings for the year ending Dec. 31, have been reported as follows:

	1896.	1895.	Inc. or Dec.
Gross earn	$5,299,025	$4,513,206	I. $785,819
Oper. expen	2,773,067	2,441,797	I. 331,270
Net earn	$2,525,958	$2,071,409	I. $454,549
Reduced to United States Currency, 80 per cent.			
Net earn	$2,020,766	$1,657,126	I. $363,640
Fixed charges	1,618,144	1,498,236	I. 129,908
Surplus	$402 622	$158,890	I. $243,732

New York, New Haven & Hartford.—At the last meeting of the Board of Directors, President C. P. Clark presented a statement of the expenditures on capital account made under his administration during the last 10 years. The statement shows that $60,425,738 was spent for reconstruction, improvement and extension, including the investment in the New England Railroad, but excluding the Old Colony and Boston & Providence systems, except for advances made in connection with the Boston terminals. The capital stock of the company is now $47,475,700, the debentures $16,397,200, and notes payable $8,868,000, a total of $72,770,900 against a capital stock of $15,500,000 in 1887. This makes a total increase in stock and debt of $57,270,900. During this period of 10 years $29,113,247 was spent for construction, permanent improvements and equipment of the property. Of this amount $7,584,774 was paid for real estate and right of way, $9,730,886 for four-tracking the New York Division, $3,223,389 for double-tracking the Shore Line Division and $3,826,908 for new rolling and floating stock. A total of $5,900,060 was spent for acquisition by exchange of stocks of leased lines merged, $10,127,347 was paid for acquisition of stocks and bonds of leased lines not merged, and $13,212,017 for investment in stocks and bonds of certain railroad companies.

North Carolina.—Governor Russell, who has been leading the movement to disrupt the lease of this road to the Southern, last week appointed a new board of directors composed entirely of anti-lease men, as follows: Charles A. Cook, Virgil S. Lusk, Wm. Gilchrist, J. S. Armstrong, H. U. Butters, A. W. Graham, John Graham. The new President is Dr. R M. Norment, a Republican politician of Robeson County. Attorney-General Walser, who is opposed to the Governor's plans to annul the lease, will respond to the summons of the Court April 6. Whether the Governor will do so seems to be doubtful. The Governor's defense of his action is that the U. S. Court has no authority to enjoin him as the representative of a sovereign state in the matter of testing in the state courts whether the lease is *ultra vires*. The Governor experienced much difficulty in securing eight men who owned five shares each of stock to accept positions as directors.

Northern Pacific.—On March 22, Judge Jenkins, at Milwaukee, Wis., directed Special Master Carey to cancel $6 726,000 of the consolidated mortgage bonds held by the new company. The consolidated bonds were among the liabilities, for the security of which the company pledged its property that passed in the sale as "the second parcel." The petition shows that $2,000,000 of the consolidated bonds, par value, were pledged with the Northwestern Equipment Co. as security, and the rail road company has purchased all of the stock of that compa y. The balance of the bonds, $4,726,000, were among the securities pledged to secure the Receiver's certificates and which the company has acquired by purchase.

Ogdensburgh & Lake Champlain.—On March 21 this road passed from the control of the Central Vermont into the hands of Charles S. Parsons, Receiver. The road was leased to the Central Vermont in perpetuity on June 1, 1886, a controlling interest having been acquired by the latter road two years previous to that time. Default was made April 1, 1896, and suit was brought by the bondholders.

Oregon Short Line.—The final separation of the company from the Union Pacific took place on March 17, and all trains are now moving under the new management. The headquarters of the company have been changed from Omaha to Salt Lake City, and it is expected that all shop work will also be done at Salt Lake; arrangements are now being made for the erection of new shops at that place. A mortgage or trust deed has been filed by the company in favor of the Guaranty Trust Co., of New York, providing that in consideration of the conveyance of the railroad franchise and other properties, the company agrees to execute a mortgage or a deed of trust conveying the road to the trust company for $12,328,000.

Pittsburgh, Cincinnati, Chicago & St. Louis.—Earnings for February and for the two months ending Feb. 28 were as follows:

February:	1897.	1896.	Inc. or Dec.
Gross earn	$1,069,272	$1,177,000	D. $107,728
Oper. expen	859,799	952,389	D. 92,590
Net earn	$209,473	$224,611	D. $15,138
Two months:			
Gross earn	$2,108,423	$2,413,770	D. $305,347
Oper. expen	1,602,134	1,887,595	D. 285,461
Net earn	$506,289	$526,175	D. $19,886

Southern Pacific.—The earnings of the entire system for January have been reported as follows:

	1897.	1896.	Inc. or Dec.
Gross earn	$3,384,183	$3,624,975	D. $240,792
Oper. expen	2,376,442	2,518,455	D. 142,113
Net earn	$1,007,841	1,106,520	D. $98,679

Shore Line (Conn.).—At a meeting of the Directors, held on March 22, the action of President Clark certifying the transfer of all stock of the company to the New York, New Haven & Hartford was ratified. This is preliminary to the legal formalities closing the company's corporate existence. The total stock of the company is 100,000 shares, of which 8,180 shares had been exchanged for 6.135 shares of the New York, New Haven & Hartford at the date of that company's last report, June 30, 1896. The road was leased to the New York & New Haven Railroad Nov. 1, 1870, and the lease was subsequently transferred to the New York, New Haven & Hartford. The road is 49.4 miles long and extends from New Haven to New London.

Texas & Pacific.—The annual report of the company, which was presented to the stockholders at their annual meeting on March 17, showed that the earnings for the year ending Dec. 31 were as follows:

	1896	1895.	Inc. or Dec.
Gross earn	$6,825,144	$7,015,308	D. $190,164
Oper. expen	5,153,578	5,188,437	D. 34,859
Net earn	$1,671,566	$1,826,871	D. $155,305
Other income	109,533	86,323	I. 23,210
Total	$1,781,099	$1,913,194	D. $132,095
Charges and taxes	1,570,907	1,575,590	D. 4,683
Surplus	$210,192	$337,604	D. $127,412
Betterments	9,915	.....	I. 9,915
Surplus	$200,277	$337,604	D. $137,327

The report shows a surplus over charges and betterments amounting to $200 277. Cash on hand and amounts due from different sources exceeded current liabilities by $149,020, and the excess of current assets over current liabilities was $262,111. The company expended $206,286 for new cars, leaving a deficit of $6,002. During the year 5,249 tons of rails and 300 cars were purchased, costing $312,615. In addition, $111,149 car-trust notes were paid and canceled, leaving outstanding $102,104. The company has in the treasury $1,763,000 second mortgage bonds which are expected to become a valuable asset as the property improves in value. The balance sheet of Dec. 31 shows the total assets to have been $94,930,617, of which $80,534,257 is set against road and equipment. The capital stock was $38,710,900, new first mortgage bonds $24,990,952, second mortgage bonds $24,935,588, and first mortgage E. D. bonds $3,784,000.

West Jersey & Seashore.—The report issued by the General Manager of the operations of the road and ferries for the year ending Dec. 31 shows that the total earnings from all sources amounted to $2,554,919, of which $1,598,613 was from passenger traffic and $709,520 from freight traffic. The total operating expenses were $1,968,031, making the net earnings for the year $586,888.

Electric Railroad News.

Dallas, Tex.—Charles E. Bird has been appointed Receiver of the Dallas Street Railway Co., which was formed in January, 1896. There is $500,000 of 5 per cent. first mortgage bonds and $150,000 preferred mortgage 6 per cent. bonds.

Hannibal, Mo.—On March 15 Mr. D. Thomson, of Ithaca, N. Y., representing a syndicate of Eastern capitalists, purchased the Hannibal Street Railway plant. The purchasers propose to rebuild the line, erect new buildings, increase the power and extend the line to the cemeteries, to Oakwood, and in other directions. It is stated that a separate company will be organized to build the extensions, with a capital of $150,000.

Jersey City, N. J.—The following are the newly elected Directors of the Consolidated Traction Co., of Jersey City: E. F. C. Young, John D. Crimmins, P. A. B. Widener, A. J. Cassatt, C. A. Griscom, J. O'Rourke, T. F. Ryan, George F. Perkins, Abram Q. Garrettson, William L. Elkins, E. B. Gaddis, Thomas Dolan, A. H. Paget, David Young and J. R. Shanley.

New Haven, Conn.—The Committee of Promoters of the Torrington & Winchester Trolley road has voted to issue bonds, if necessary, and to capitalize the company at $200,000.

St. Louis, Mo.—President Charles Green, of the Peoples' and the Fourth Street & Arsenal Railroads, who was recently appointed Receiver of both lines, has issued a circular to the bondholders in which he outlines a plan for the complete reorganization of the company. It is proposed to issue $2,000,000 of bonds under date of July 1, 1897, to run 40 years at 5 per cent. The bondholders are to turn in the bonds of the old issue and accept in return new bonds to cover both principal and unpaid interest.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, March 24, 1897.

The Supreme Court decision declaring that the anti-trust law condemns railroad traffic agreements has caused endless discussion here, and railroad officers of all grades take despondent views. It is said that the Atchison and St. Paul, acting on the advice of their lawyers, have already decided to withdraw from all associations, on the ground that the associations are unlawful. Other roads are said to have practically decided to take the same step. As is well known, the agreement of the Western Freight Association is much more rigid than that of the Joint Traffic Association and the Southwestern Association is also somewhat more open to the suspicion of being repugnant to the Federal laws. The Presidents of the principal Western roads may now be said, however, to have a pretty good understanding with each other, and it does not follow that rates will be cut. The stability of rates still depends in a large degree upon the honor of the Presidents and their good will toward each other, the same as it did before the present associations were formed, and these elements of strength remain unimpaired.

Executive officials and freight representatives of the roads running through Kansas held an important meeting in this city on Monday, to try and devise means for heading off the adoption of the proposed maximum freight law in that state. No positive action was decided upon, but it was given out that a compromise bill would probably be drawn up, with the hope of defeating Populist Brown's pet bill.

A petition has been filed with the Interstate Commerce Commission by the roads running to the Northwest, praying that the fourth section of the interstate commerce law be suspended, in order that they may compete with the Canadian Pacific on business to the Kootenai mining country. That company demands a $7.50 differential in order to be able to compete for the traffic. The Chicago-St. Paul roads, the Northern Pacific and the Great Northern, acting in conjunction with the Grand Trunk of Canada, have brought the matter before the Interstate Commission.

Notwithstanding the fact that the business to the Young People's Christian Endeavor Association's convention at San Francisco does not move until next July, considerable friction has already developed. The Endeavor officers persist in their demands for free transportation for officers, state managers and committees. Secretary Baer is on record as stating that he is anxious to co operate with the roads in working the business in a legitimate manner, but regardless of what his attitude is the state officers are climbing over each other in their efforts to get to San Francisco and back free, and ride there in a private car, if possible. Mr. Caldwell is now in Boston conferring with the general officers of the association, and it is expected matters will be adjusted in some way.

Notice has been given of a conference of the members of the Western Freight Association for the purpose of obtaining their views as to the expediency of modifying the ruies governing territorial jurisdiction of the association as agreed to when the new association was formed. It is not likely that any serious disagreement will result.

The Rock Island has made a proportionate lake and rail rate on through grain to the Atlantic seaboard from Kansas points to Chicago which is lower than the tariff authorized by the Western Freight Association. It is probable that the other roads will be allowed to meet the reduction east of the Missouri River.

Eastbound shipments from Chicago and Chicago Junctions to points at and beyond the Western termini of the trunk lines for the week ending March 18 amounted to 102,327 tons, as compared with 112,378 tons the preceding week. This statement includes 51,918 tons of grain, 11,930 tons of flour and 9,599 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

Roads.	WEEK ENDING MAR. 18.		WEEK ENDING MAR. 11.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	7,540	7.4	6,522	5.8
C., C., C. & St. Louis	7,839	7.7	8,121	7.2
Erie	10,935	10.7	12,265	10.9
Grand Trunk	9,272	9.1	10,497	9.4
L. S. & M. S.	11,507	11.2	15,894	14.2
Michigan Central	13,395	13.1	16,887	15.0
N. Y., Chi. & St. L.	11,297	11.0	13,299	11.8
Pitts., Cin., Chi. & St. Louis	9,078	8.9	9,943	8.9
Pitts., Ft. Wayne & Chicago	13,015	12.7	12,037	10.7
Wabash	8,449	8.2	6,913	6.1
Totals	102,327	100.0	112,378	100.0